THE NEW INTERNATIONAL ENCYCLOPÆDIA

EDITORS

DANIEL COIT GILMAN, LL. D.

PRESIDENT OF JOHNS HOPKINS UNIVERSITY (1876–1901)

AFTERWARDS PRESIDENT OF THE CARNEGIE INSTITUTION OF WASHINGTON

HARRY THURSTON PECK, PH. D., L. H. D.

PROFESSOR IN COLUMBIA UNIVERSITY

FRANK MOORE COLBY, M. A.

LATE PROFESSOR OF ECONOMICS

IN NEW YORK UNIVERSITY

VOLUME XV

NEW YORK

DODD, MEAD AND COMPANY

1905

Presswork by
The University Press, Cambridge, U. S. A.

ILLUSTRATIONS IN VOLUME XV.

COLORED PLATES

MAPS

ENGRAVINGS

KEY TO PRONUNCIATION.

ā as in ale, fate. Also see **è**, below.
ȧ " " senate, chaotic. Also see **è**, below.
â " " glare, care.
ă " " am, at.
ä " " arm, father.
à " " ant, and final *a* in America, armada, etc. In rapid speech this vowel readily becomes more or less obscured and like the neutral vowel or a short u (ŭ).
a " " final, regal, where it is of a neutral or obscure quality.
a " " all, fall.
ē " " eve.
ė " " elate, evade.
ĕ " " end, pet. The characters *ĕ*, *ā*, and *ä̆* are used for *ä* in German, as in Gärtner, Gräfe, Hähnel, to the values of which they are the nearest English vowel sounds. The sound of Swedish *ä* is also indicated by *ĕ*.
ẽ " " fern, her, and as *i* in sir. Also for *ö*, *oe*, in German, as in Göthe, Goethe, Ortel, Oertel, and for *eu* and *oeu* in French, as in Neufchâtel, Crèveœur; to which it is the nearest English vowel sound.
e " " agency, judgment, where it is of a neutral or obscure quality.
ī " " ice, quiet.
i " " quiescent.
ĭ " " ill, fit.
ō " " old, sober.
o̊ " " obey, sobriety.
ô " " orb, nor.
ŏ " " odd, forest, not.
o " " atom, carol, where it has a neutral or obscure quality.
oi " " oil, boil, and for *eu* in German, as in Feuerbach.
o͞o " " food, fool, and as *u* in rude, rule.
ou " " house, mouse.
ū " " use, mule.
u̇ " " unite.
ŭ " " cut, but.
u̥ " " full, put, or as *oo* in foot, book. Also for *ü* in German, as in München, Müller, and *u* in French, as in Buchez, Budé; to which it is the nearest English vowel sound.
û " " urn, burn.
y " " yet, yield.
B " " the Spanish Habana, Cordoba, where it is like a *v* made with the lips alone, instead of with the teeth and lips.
ch " " chair, cheese.
Đ as in the Spanish Almodovar, pulgada, where it is nearly like *th* in English then, this.
g " " go, get.
G " " the German Landtag, and *ch* in Feuerbach, buch; where it is a guttural sound made with the back part of the tongue raised toward the soft palate, as in the sound made in clearing the throat.
H as *j* in the Spanish Jijona, *g* in the Spanish gila; where it is a fricative somewhat resembling the sound of *h* in English hue or *y* in yet, but stronger.
hw " *wh* in which.
K " *ch* in the German ich, Albrecht, and *g* in the German Arensberg, Mecklenburg; where it is a fricative sound made between the tongue and the hard palate toward which the tongue is raised. It resembles the sound of *h* in hue, or *y* in yet; or the sound made by beginning to pronounce a *k*, but not completing the stoppage of the breath. The character K is also used to indicate the rough aspirates or fricatives of some of the Oriental languages, as of kh in the word Khan.
n̰ as in sinker, longer.
ng " " sing, long.
N " " the French bon, Bourbon, and *m* in the French Etampes; where it is equivalent to a nasalizing of the preceding vowel. This effect is approximately produced by attempting to pronounce 'onion' without touching the tip of the tongue to the roof of the mouth. The corresponding nasal of Portuguese is also indicated by N, as in the case of São Antão.
sh " " shine, shut.
th " " thrust, thin.
TH " " then, this.
zh as *z* in azure, and *s* in pleasure.

An apostrophe ['] is sometimes used to denote a glide or neutral connecting vowel, as in tā'b'l (table), kāz'm (chasm).

Otherwise than as noted above, the letters used in the respellings for pronunciation are to receive their ordinary English sounds.

When the pronunciation is sufficiently shown by indicating the accented syllables, this is done without respelling; as in the case of very common English words, and words which are so spelled as to insure their correct pronunciation if they are correctly accented. See the article on PRONUNCIATION.

A PARTIAL LIST OF THE LEADING ARTICLES IN VOLUME XV.

THE NEW INTERNATIONAL ENCYCLOPÆDIA

ONA, ō'nä. A group of tribes, apparently constituting a distinct linguistic stock, inhabiting the shores and islands of the Strait of Magellan and the northwestern part of Tierra del Fuego. In spite of the cold and desolate nature of the country, they go almost naked and build only slight brushwood shelters, protecting their bodies by copious rubbing of grease. They are tall and strongly built, and are expert hunters and fishers, using the club, sling, bow, bolas, and lance. Their bark canoes withstand almost any storm, and the baskets woven by the women are so well made that they will hold water. They have also trained dogs to hunt. Little is yet known of their religion or sociology, which, however, appear to be as elaborate as among most roving tribes. They formerly numbered nearly 3000, but are being exterminated by the sheep-herders who have occupied the country.

ONA'TAS (Lat., from Gk. *Ὀνάτας*). A Greek artist, whose activity extended from about B.C. 490 to 460. He was a native of Ægina and son of Micon. Among his famous works were a four-horse chariot at Olympia made for Hiero of Syracuse to commemorate a victory in the games, a colossal Hercules at the same place, dedicated by the Thasians, and a group of the Greek heroes casting lots to determine who should accept the challenge of Hector. At Delphi was a large group of fighting men dedicated by the Tarentines. Onatas is known only as a worker in bronze, but it is probable that the Æginetan sculptures (q.v.) show his influence on the art of his native island.

OÑATE, ō-nyä'tā, JUAN DE (c.1555-c.1615). A Spanish explorer, settler of New Mexico. He was born at Guadalajara, Mexico, of which city his father was the founder, and married a granddaughter of Cortés. In 1595 he received permission from the Viceroy, Velasco, to colonize what is now New Mexico. After his preparations were complete, the start was delayed by Monterey, who had succeeded Velasco as Viceroy, and who wished to transfer the grant to Pedro Ponce de Leon. In the latter part of January, 1598, the force of 130 colonists with servants and Indians started from Zacatecas; it crossed the Rio Grande in April; and in August founded San Juan, the first capital of New Mexico. Oñate led several expeditions into Arizona (1599, 1604, and possibly 1611), and seems not to have been Governor of the new settlements after 1608. The principal source for the history of the expedition is an epic poem by Gaspar de Villagrá (or Villagran), a captain, who accompanied Oñate and made him the hero of the epopee.

ONAWA, ōn'ä-wä. A town and the county-seat of Monona County, Iowa, 59 miles north of Council Bluffs; on the Illinois Central and the Chicago and Northwestern railroads (Map: Iowa, A 3). It carries on considerable trade as the commercial centre of a productive farming and stock-raising country. There is a public library. Population, in 1890, 1358; in 1900, 1933.

ONCKEN, ôṅk'en, AUGUST (1844—). A German economist, of the historical school. He was born at Heidelberg, studied there, at Munich, and at Berlin, and in 1872 became professor of political economy and statistics in the Imperial Agricultural Institute in Vienna, whence in 1877 he went to the Polytechnic Institute at Aix-la-Chapelle and in 1878 to the University of Bern. Among his works are: *Adam Smith in der Kulturgeschichte* (1874); *Adam Smith und Immanuel Kant* (1877); *Die Maxime "Laissez faire et laissez passer"* (1877); a valuable critical edition of Quesnay (1888), which gave fresh stimulus to the study of the physiocrats; *Geschichte der politischen Oekonomie* (part i., 1901); and contributions to *Berner Beiträge zur Geschichte der Nationalokonomie*, of which he was editor.

ONCKEN, WILHELM (1838—). A German historian, brother of August Oncken. He was born in Heidelberg; was educated there, and at Göttingen and Berlin; taught at Heidelberg (1862-70); and in 1870 was appointed professor of history at Giessen. In 1877 he became editor of the comprehensive series entitled "Allgemeine Geschichte in Einzeldarstellungen." He wrote: *Athen und Hellas* (1865-66); *Stadt, Schloss und Hochschule Heidelberg* (3d ed. 1885); and in the series mentioned: *Das Zeitalter Friedrichs des Grossen* (1881-83); *Das Zeitalter der Revolution,*

des Kaiserreichs und der Befreiungskriege (1885-87); and *Das Zeitalter des Kaisers Wilhelm I.* (1890-92).

ONCOCARPUS (Neo-Lat., from Gk. ὄγκος, *onkos*, hook, + καρπός, *karpos*, fruit). A genus of trees of the natural order Anacardiaceæ. *Oncocarpus vitiensis*, a remarkable Fiji Island tree about 60 feet high, has large oblong leaves, and a corky fruit, somewhat resembling the seed of a walnut. Its sap when brought in contact with the skin is very caustic, for which reason the wood is often called itch wood. The exhalations are said to cause itching with irritation for several days.

ONCORHYNCHUS (Neo-Lat., from Gk. ὄγκος, *onkos*, hook + ῥύγχος, *rhynchos*, snout). A genus of salmon including those of the Pacific coast, several species of which are of commercial importance. See SALMON.

O'NEALL, ō-nēl', JOHN BELTON (1793-1863). An American jurist. He was born in South Carolina, graduated at South Carolina College in 1812, and was admitted to the bar two years later. He served in the Legislature, and was Speaker in the House before being chosen associate judge in 1828. He was later judge in the Court of Appeals, and was also most energetic in promoting business enterprises which might benefit the State. Besides being a frequent contributor to the press on educational, temperance, and religious matters, he was the author of *A Digest of the Negro Law of South Carolina* (1848); *Annals of Newberry, S. C.* (1858); and *Biographical Sketches of the Bench and Bar of South Carolina* (1859).

ONEGA, ō-nyā'gȧ, LAKE. A lake in the northern part of Russia, Government of Olonetz (Map: Russia, E 2). It is, next to Ladoga (q.v.), the largest lake in Europe, and measures 150 miles in length by 50 miles in greatest width, its area being 3700 square miles. Its greatest depth is over 1400 feet. The north shore is indented with numerous deep and narrow fiords, and the lake contains a large number of islands, some of which are inhabited. Lake Onega receives the waters of a number of other lakes to the north and east of it, its own waters flowing into Lake Ladoga through the Svir. A canal runs along the south shore of the lake, from the Svir on the west to the Vytegra on the east, the latter river being further connected by canals with the Volga and the Dvina.

ONEGLIA, ō-nā'lyȧ. A town in the Province of Porto Maurizio, Italy, 40 miles east-northeast of Nice, on the Gulf of Genoa, at the mouth of the Impero, here crossed by two iron bridges (Map: Italy, C 4). The town has a prison resembling a church. It is a garrison town and a sea-bathing resort. It carries on a shipping trade in wine, oil, and fruits. Andrea Doria, the Genoese admiral, was born here. Population (commune), in 1881, 7286; in 1901, 8527.

ONE-HOSS SHAY, THE WONDERFUL. A familiar humorous poem by Oliver Wendell Holmes (1858), published under the title of *The Deacon's Masterpiece*. It tells of a vehicle constructed with such care that, after a long life, all its parts came to a sudden end at the same moment.

ONEIDA, ō-nī'dȧ. A central tribe of the Iroquois Confederacy (q.v.). The name by which they are commonly known is a corruption of their proper name, *Oneyotka-ono*, commonly rendered 'people of the stone,' referring to the tribal palladium, the celebrated 'Oneida Stone,' a large granite boulder near the site of their ancient village on Oneida Lake. Their territory was about the lake of the same name, in central New York, and extending southward to the waters of the Susquehanna. They were considered a younger member of the confederacy, and never attained any special prominence in its affairs, seeming always to have acted contrary to the spirit of the league, being usually friendly to the French and Jesuits, of whom the majority of the Iroquois were the determined enemies; at a later period they, almost alone of their kindred, took sides with the Americans in the Revolutionary War. Their friendship for the Americans during this struggle was due chiefly to the influence of their Congregational missionary, Samuel Kirkland, and drew down upon them the vengeance of the hostile Iroquois under Brant, who burned their villages and forced them to take refuge within the American settlements until the close of the war, when the main body returned to their former homes, while a considerable number emigrated to Canada and settled upon Thames River, Ontario, where they still remain. Between 1820 and 1835, having sold most of their lands in the State of New York, the majority of the Oneida removed to a reservation at the head of Green Bay, Wis., where they now reside, being fairly prosperous and civilized, as are also those in New York and Canada. The whole tribe numbers at present considerably over 3000 (being probably more numerous than at any former period of its history), distributed as follows: Oneida reservation, Wisconsin, 1980; Oneida and other reservations, New York, 270; 'Oneidas of the Thames,' Ontario, 800; with Six Nations on Grand River, Ontario, not specified.

ONEIDA. A city in Madison County, N. Y., 27 miles east of Syracuse; on the New York Central and Hudson River, the New York, Ontario and Western, and the West Shore railroads (Map: New York, E 2). It has a fine high school building, a public library, a city hospital, and Allen and Higenbotham parks. It is but five miles distant from Oneida Lake, on the southern shore of which is Sylvan Beach, a popular watering place. The industrial interests are represented by iron works, and manufactories of caskets, flour, hosiery, handcarts, carriages, wagons, furniture, steel and wood pulleys, and sash and blinds. The surrounding country is agriculturally productive. Under a charter of 1901, the government is administered by a mayor and common council, biennially elected. The water-works are owned and operated by the municipality. Population, in 1890, 6083; in 1900, 6364. The first settlers within the present limits of Oneida came in 1834, but a village was not established until 1839, and was not incorporated until 1848. The city was chartered in 1901. Oneida Castle, the ancient seat of the famous Oneida Indians, is not far distant, and two miles to the south is the Oneida Community (q.v.). Consult Durant, *History of Oneida County, N. Y.* (Philadelphia, 1878).

ONEIDA COMMUNITY. A communistic settlement at Oneida, Madison County, N. Y.,

founded in 1847 by John Humphrey Noyes (q.v.). It had a religious origin, Noyes having been led by his New Testament studies to believe in the possibility of Christians living a sinless life, and in other doctrines at variance with those of the established churches. In 1838 a small settlement of his disciples was formed in Putney, Vt., the home of his father's family, where it existed till its removal in 1847-48 to Oneida, N. Y. For the first ten years the Oneida Community was not financially successful, but after 1857 was prosperous, largely through the manufacture of the Oneida trap. There was no formally chosen leader, as it was believed that the most fit would naturally control, and Noyes remained the leading spirit. The distinguishing feature of the social life was the system of 'complex marriage.' Marriage was not permanent, but license did not prevail, as the marital relations were carefully regulated, and the Community assumed responsibility for the support and education of the children. A novel feature of the life was the plan of 'mutual criticism,' which is said to have successfully taken the place of ordinary means of government in the society. Outside opposition to this system, especially on the part of the churches, led to its abandonment in 1879, and the voluntary dissolution of the Community and re-organization into a joint-stock company took place January 1, 1881; but while communism of property and the distinctive social life were given up, a common dining-room, laundry, library, and assembly-hall and other coöperative features are still retained. At the time of the dissolution of the Community it had about 238 members, with 45 others at a branch at Wallingford, Conn., owned 650 acres of land, with numerous manufacturing establishments and other buildings, the total property being valued at $600,000. It has since largely increased its property and business, having manufactories at Kenwood, Sherrill, and Niagara Falls, N. Y., and Niagara Falls, Ont. Consult: Noyes, *The Berean* (Putney, 1847); id., *History of American Socialisms* (Philadelphia, 1870); Nordhoff, *Communistic Societies of the United States* (New York, 1875); Hinds, *American Communities* (Chicago, 1902). See COMMUNISM.

ONEIDA LAKE. A body of water in central New York, between the counties of Madison, Oneida, Onondaga, and Oswego, 11 miles northeast of Syracuse (Map: New York, E 2). It is 20 miles long, from 4 to 7 miles wide, and is connected with Lake Ontario by the Oneida and Oswego rivers. Oneida Lake was an important commercial highway before the era of railroads.

O'NEILL, *ō-nēl'*, ELIZA, later Lady BECHER (1791-1872). An Irish tragedienne, daughter of an actor, who managed the Drogheda Theatre. After playing for some years in Ireland, she went to London, where, on October 6, 1814, she appeared as Juliet at Covent Garden. Her success was immediate, and for five years she was the most popular actress in Great Britain. Then she married William Wrixon Becher, one of the Irish members of Parliament, who afterwards succeeded to a baronetcy. After her marriage she never again appeared on the stage.

O'NEILL, HUGH. See TYRONE.

O'NEILL, OWEN ROE (Gael. *Eoghan Ruadh*, Red Owen) (?-1649). The commander of the Irish forces in the wars against the English in the first half of the seventeenth century. He was the nephew of Hugh O'Neill, Lord of Tyrone, and on the flight of the northern chiefs in 1607 he accompanied his uncle to the Continent, where he was carefully educated at Louvain. Like most of the exiles of that period, he selected the profession of arms, and rose to distinction as commander of the Irish troops in the service of Spain. In the meantime, the wholesale confiscations in the north of Ireland, known in history as the 'Plantation of Ulster,' led to a general rising of the Irish in 1641. On the invitation of a delegation sent for that purpose, O'Neill crossed over to Ireland, assumed command of the forces levied by the General Assembly of the Irish nation, and for eight years held in check the whole power of England and the Scotch 'planters.' His most signal victory was won at Benburb on the Blackwater, in Tyrone, June 5, 1646, when with 5500 men he routed Monroe's army of 7000, killing, disabling, or taking nearly one-half the enemy, and capturing all the artillery, baggage, and 1500 horses, after which, rapidly facing around, he put to flight two other detachments of 2500 troops which were marching to effect a junction with Monroe. For two years more he continued to win one victory after another, in nearly every instance against superior force or equipment, until his death, November 6, 1649, after a brief illness. His removal deprived the Irish army of competent leadership, and the execution of King Charles I. and the overthrow of the Royalist Party in England left the way clear for the invasion by Cromwell in the same year.

O'NEILL, PEGGY. See EATON, MARGARET (O'NEILL).

O'NEILL, Sir PHELIM (c.1604-53). An Irish rebel, the eldest son of Turlough O'Neill. As a youth he studied law at Lincoln's Inn, but lived a lawless life on his return to his native land, where he became an active participator in the insurrection of 1641. He was one of the five who planned to surprise Dublin Castle, and through a treacherous breach of hospitality he obtained possession of Charlemont Castle, while as the result of further successes he was made commander-in-chief of the northern Irish forces. He represented Ulster in the Confederate Council of 1642, but his failure to capture Drogheda after a prolonged siege in 1641-42 lessened the confidence of his army, which had once numbered 30,000, and he yielded the chief command to Owen Roe O'Neill (q.v.). Sir Phelim then expected to regain it, but was disappointed, and he went into hiding after the surrender of Charlemont in 1650, but was caught at last, tried, and executed for the atrocious massacres he had ordered. He refused to save himself by giving evidence to show that Charles I. had authorized him to raise troops in Ireland.

O'NEILL, Sir TURLOUGH LUINEACH (c.1530-95). An Irish chieftain, lord of Tyrone, in the county of Ulster, where he was born. He was a cousin of the notorious Shane O'Neill, whom he tried unsuccessfully to oust from the headship of the clan during the latter's compulsory absence in England in 1562. Turlough succeeded Shane at his death five years afterwards. Though Turlough promised fidelity to Queen Elizabeth, he excelled even his predecessor in the formation of traitorous leagues with the Scots. An unsuccessful attempt was made to capture him in 1568,

and his country was invaded by Essex, the English Governor of Ulster, in 1574. Turlough was called upon to surrender his lands, merely that he might receive them again under an English tenure. He took up arms against the English in 1579, and four years later invaded Tyrconnel, but was beaten back by O'Donnell, and he next entered into strife for the possession of lands with the Earl of Tyrone, over whom he gained a victory in 1588, but he resigned in his favor five years afterwards. While Turlough was making a final effort to regain his lost sovereignty, his castle was destroyed by Tyrone, and himself obliged to hide in a ruin near by, where he died.

ONEONTA, ō'nē-ōn'tȧ. A village in Otsego County, N. Y., 61 miles northeast of Binghamton; on the Susquehanna River, and on the Delaware and Hudson and the Ulster and Delaware railroads (Map: New York, E 3). It is the seat of the Oneonta State Normal School, and has a public library, a State armory, and the Aurelia Fox Memorial Hospital. The village carries on considerable trade, and its industrial establishments include construction and repair shops of the Delaware and Hudson Railroad, a silk mill, planing mill, knitting mill, foundries, and cigar factories. Settled about 1800, Oneonta was incorporated in 1848. Under a charter of 1885, the government is vested in a president, annually elected, and a council, chosen on a general ticket. Population, in 1890, 6272; in 1900, 7147.

ON'ESAN'DER (Lat., from Gk. *Ὀνήσανδρος, Onēsandros*). A Platonic philosopher of the first century A.D. He lived at Rome under Nero, and wrote a tract, *Στρατηγικὸς λόγος*, dedicated to Veranius, consul in 49. The work deals with the ethical duties of a general, is based on Xenophon, and was first edited in Greek in 1599. Later editions are by Koraïs (Paris, 1822) and Köchly (Leipzig, 1860).

ONE-TO-ONE CORRESPONDENCE. See CORRESPONDENCE.

ONI'AS'S TEMPLE. A sanctuary built at Leontopolis in Egypt by the Jewish high priest Onias, probably not long after the desecration of the temple at Jerusalem by Antiochus IV., Epiphanes, in December, B.C. 168. According to Josephus, this Leontopolis was situated in the Heliopolitan nome (*Ant.*, xiii. 3, 2), 180 stadia northeast of Memphis (*Bel. Jud.*, vii. 10, 3), and is not to be confused with the well-known Leontopolis in the Delta. It consequently cannot have been far from the city of Heliopolis itself. In the *Itinerarium Antonini* a *Vicus Judæorum* is mentioned that may have belonged to the Nome of Heliopolis, but is 464 stadia from Memphis. At this place, the modern Belbeis, there once was a temple of the goddess Bast, and in the neighborhood there is a Tell el-Yehudiyyeh. Another Tell el-Yehudiyyeh, however, is found near Heliopolis with a Jewish cemetery. This has been identified by Naville as the capital of 'the land of Onias,' and it is probably identical also with the *Castra Judæorum* mentioned in a *Notitia Dignitatum Orientis*, c.25 A.D., while the so-called Camp of the Jews (*Ant.*, xiv. 8, 2) was in another direction, northwest of Memphis. A temple of Bast is perhaps more likely to have been allowed to fall into ruins there than nearer to Bubastis. There is no reason for doubting that an old pagan temple was given to Onias and remodeled by him. The tower-like shape indicates this. If it had been a new structure, the pattern of the temple in Jerusalem would no doubt have been followed in regard to the exterior as well as the interior.

As to the identity of the Jewish high priest there is still some uncertainty. In his *Jewish War*, written a few years after the fall of Jerusalem, Josephus states that Onias, son of Simon, fled from Antiochus IV., Epiphanes, to Egypt, and built the temple of Leontopolis (i. 1, 1, vii. 10, 2-4). He would consequently be Onias III., son of Simon the Just. With this agree Theodore of Mopsuestia, in his commentary on Psalm lv., the references in the Palestinian Talmud (Yoma vi. 3), and the Babylonian Talmud (Menachoth 109 a). On the other hand, Josephus declares in his *Antiquities* (xii. 5, 1; xii. 9, 7; xiii. 3, 1-3; xiii. 10, 4; xx. 10) that the builder was a son of Onias III., who fled to Egypt in the time of Antiochus V., Eupator (B.C. 164-162), when Menelaus was deposed, and Alcimus took his place. As the *Antiquities* were written c.95 A.D., and therefore may be thought to represent more careful research, and it is told in II. Macc. iv. 33 sqq. how Onias III. was murdered by Andronicus in a sanctuary at Daphnæ, near Antioch, and bitterly lamented by Antiochus IV., many scholars have credited the later account rather than the earlier. But neither Josephus himself nor Theodore, who elsewhere follows II. Maccabees, mentions any such murder of Onias, and Baethgen, Willrich, and Wellhausen have strongly argued that the notice is unhistorical, being either a confusion with the murder of Menelaus or a transference to the Jewish high priest of the tragic fate of a son of Seleucus murdered by Andronicus at Daphnæ and naturally mourned by Antiochus. Josephus may, in his old age, have been misled by a poorer source or an altered tradition, a change of attitude toward the temple at Leontopolis being clearly discernible on the part of the Jewish teachers.

If it was Onias III. who in B.C. 170 fled to Egypt, it is natural to suppose that the desecration of the temple in Jerusalem and its dedication to Zeus Olympius in B.C. 168 led him to ask Ptolemy VII., Philometor, and Cleopatra I. for the temple of Bast at Leontopolis. For three years the legitimate high priest and ethnarch would then have officiated in a temple dedicated to the worship of Yahweh before the restoration of the Yahweh cult in Jerusalem in December, B.C. 165. Onias not only had with him numerous emigrants who formed military colonies, but left behind many sympathizers. This is evident from Isaiah xix. 18-25, probably written in B.C. 150, when Jonathan sat by the side of Alexander Balas, as he was married to Cleopatra. Here reference is made to five cities in Egypt occupied by Hebrews, one of them called Leontopolis (the city of the Lion), and to an altar and sacred stone (or 'tower,' if the word is read Mizpah) at the border of Egypt, where the Egyptians are expected to offer sacrifices to Yahweh. The feeling of the Greek translator toward Leontopolis is seen in his rendering the name 'The City of Righteousness.' It has been supposed that the *Sibylline Oracles* (v. 492 seq.) refer to this temple, but that is probably wrong. Early regulations preserved in the Mishna

ONIONS, OYSTER PLANT, ETC.

1. CARROT (Daucus carota).
2. PARSNIP (Peucedanum sativum).
3 and 4. ONION (Allium Cepa).
5. LEEK (Allium Porrum).
6. GARLIC (Allium sativum).
7. OYSTER PLANT (Tragopogon porrifolius).

(Menachoth xiii. 10) provide that a sacrifice promised to this temple should be offered there, and that priests of the temple should not lose their priestly dignity or share of the offerings if they came to Jerusalem. It is only after the destruction of the temple, and especially by rabbis of the second and third centuries, that the cult there was condemned (Menachoth, 109 b). After the fall of Jerusalem in A.D. 70 it seems to have enjoyed such favor that the Romans had reason to fear it, and after A.D. 72 Lupus closed it, and some time later, possibly A.D. 75, Paulinus destroyed it (*B. Jud.*, vii. 10, 2-4). Josephus states that it had then stood 343 years. This is no doubt an error for 243, which would place its consecration as a Yahweh sanctuary in B.C. 168. Consult: Cassel, *De Templo Oniæ Heliopolitano* (Bremen, 1730); Herzfeld, *Geschichte des Volkes Israel*, vol. ii., p. 557 seq. (Leipzig, 1863); Ewald, *Geschichte des Volkes Israel*, vol. iii., p. 405 seq. (Göttingen, 1852); Graetz, *Geschichte der Juden* (4th ed., Leipzig, 1888); Baethgen, in *Zeitschrift für alttestamentliche Wissenschaft*, vol. vii. (Giessen, 1886); Willrich, *Juden und Griechen vor der makkabaischen Erhebung* (Göttingen, 1895); id., *Judaica* (Göttingen, 1900); Bertholet, *Die Stellung der Israeliten und der Juden zu den Fremden* (Leipzig, 1896); Schürer, *Geschichte des jüdischen Volkes*, vol. iii. (3d ed., Leipzig, 1898); Derenbourg, *Essai sur l'histoire et la géographie de la Palestine* (Paris, 1867); Naville, *Seventh Memoir of Egypt Exploration Fund* (London, 1888); Wellhausen, *Israelitische und jüdische Geschichte* (3d ed., Berlin, 1899); Hamburger, in *Real-Encyclopädie des Judenthums* (Strelitz, 1896).

ONION (Fr. *oignon, ognin*, from Lat. *unio*, pearl, onion). Certain species of the genus Allium (q.v.), particularly *Allium cepa*, a biennial bulbous-rooted vegetable with a swelling stem, leafy at the base and with tapering fistular leaves. The bulb is composed of thickened leaf elements in concentric layers. The native country of the onion is not certainly known, but is probably either India or Egypt, in both of which countries it has been cultivated from the most remote antiquity. The part chiefly used is the bulb, but the young leaves are also employed and young seedlings drawn from onion beds are a very common ingredient in soups and sauces in the beginning of summer.

The onion requires a light, friable, well-drained soil, well stocked with organic matter and liberally fertilized. Reclaimed marsh soils are successfully and extensively used for growing the crop. Onions are propagated from: (1) sets, i.e. little bulbs which form on the tops of the stems of some varieties in place of seed, or by division of the parent bulb as in the case of the potato onion, or from small onions obtained from thickly sown seed; and (2) from seed. The first method is the one generally employed by farmers and market gardeners in growing early bunching onions. The sets are planted either in the fall or spring in rows a foot apart and three inches distant in the row. The main crop of onions is usually grown from seed sown in the open field in rows 12 to 14 inches distant and thinned to 3 inches in the row. Sometimes the seed is sown in the fall and transplanted to the field in the spring; but the method coming into vogue now in the United States is to sow the seed under glass in the early spring and transfer to the field as soon as the weather will permit. Besides the certainty of an even stand by this method, the yields are much higher, the bulbs grade more uniformly, and the extra cost of transplanting is not much more than the cost of thinning and weeding when the seed is sown in place. Thorough cultivation is essential by whatever method grown. The bulbs are harvested when the most of the necks turn yellow, and are cured in rows if the weather is not too hot, or in open sheds or barns in rainy weather. They may be kept over winter by freezing and keeping in that state until spring or by storing in a dry apartment and keeping the temperature just above freezing. American varieties keep longer and are better adapted to most parts of the United States, but foreign varieties are better flavored and bring a higher price in the market. Bermuda onions, Spanish onions, and some other foreign varieties are quite extensively grown in California and the Southern States.

The potato onion, also called the Egyptian or ground onion, is a perennial variety which produces offset bulbs resembling the shallot but larger. They are milder than garlic, but are stronger than the common onion. The tree onion produces bulbs at the top of the stem, the umbels becoming viviparous. The Welsh onion (*Allium fistulosum*), also called cibol, is little cultivated in America. Its leaves are used like those of the shallot, by which name it is also known. Onions are similar to but milder than garlic (q.v.).

ONION-FISH. See GRENADIER.

ONION INSECTS. The principal insects which damage the onion crop are the onion-maggot (larva of *Phorbia cepetum*), the onion-thrips (*Thrips tritici*), and the onion-cutworm (larva of *Agrotis messoria*). The adult of the onion-maggot is a fly of the family Anthomyiidæ. The eggs are laid early in the spring, next to the stems or leaves at the surface of the ground, and preferably in young onion beds. The larvæ work their way into the bulb and cause the rapid decay and death of the plant. Inasmuch as the bulb is the edible part of the vegetable, the slightest damage by these maggots is fatal, since the decay continues even after the maggots are killed. The maggots reach full growth about the end of May, and about the middle of June the second generation of flies occurs. This generation often attacks seedling onions, ruining entire beds. The insect passes the winter partly in the pupa state in the ground, and partly as adult in sheltered locations. On a small scale damage may be prevented by the use of sand soaked in kerosene, mixed with drier sand and placed at the base of the onion plants along the rows. This prevents egg-laying and kills such of the young maggots as attempt to work through it. On a large scale, the first plants which wilt must be lifted out and destroyed, and then kainit and nitrate of soda must be applied broadcast to the roots.

The onion-thrips sometimes attacks onions in great numbers, puncturing the succulent leaves and leaving a small yellow dot after each puncture. The leaf gradually loses its vitality and the top turns yellow. This thrips is not confined to the onion, but is also found upon cabbages and the flowers of the orange farther South.

In 1898 the product reached 8,300,000 pounds, over half of which was exported into the United States. Iron is found in the same region as copper, and also in the region north of Kingston. An adverse tariff had prevented mining operations until recently, when the province placed a bounty upon its production. Since that time the industry has rapidly developed. The product for 1899 was estimated at $850,000.

Gold has been found at points along the entire length of the Archæan rocks of the province. It is in the most paying quantities, however, in the region west of Lake Superior. The gold lies in quartz veins, and only recently has its exploitation been seriously undertaken. The annual value of the product increased during 1890 to 1900 from nothing to $421,000. Silver is mined on the west shore of Lake Superior, but its production is small and uncertain. Prior to 1890 the principal mineral productions were secured from the older portion of the province, and consisted of petroleum and salt. Petroleum is found at the south point of Lake Huron in Lambton County. The average annual product from 1890 to 1900 exceeded 30,000,000 gallons. Farther north along the east shore of Lake Huron are the salt beds, whose annual yield from 1890 to 1900 averaged over $200,000. During the last decade, the mineral wealth of peninsular Ontario has been increased by the development of natural gas fields near Niagara in the east and near Detroit in the west. The product of the latter field is consumed by the city of Detroit, and that of the former by the city of Buffalo. The estimated annual value of the product since 1893 has been $350,000. Clay for brick and tile occurs in all parts of the province. Limestone and sandstone for building purposes abound in the Paleozoic region, and granite and marble are quarried in the Archæan region.

Fisheries. Ontario shares with the United States in the fishing advantages of the Great Lakes. The value of the annual catch has been above $2,500,000, about one-fourth the product being exported. Trout, whitefish, herring, and pickerel, in the order named, are the most important.

Agriculture. This, the leading industry, is highly developed throughout the lowland region. The productivity is great, the acreage yield for most crops being greater than the average for the same crops in the United States. No portion of the Dominion is superior in adaptability to mixed farming. Oats and hay lead in acreage, approximately 2,400,000 acres in each case being the average for the six years ending with 1900. Wheat increased during that period from 950,000 acres to 1,400,000. Peas are a staple crop and averaged about 800,000 acres. The average for corn and for barley has been about 500,000, the conditions being especially favorable for barley. Rye, buckwheat, beans, mangel wurzels, potatoes, and turnips are of considerable importance. Great attention is paid to apple-raising throughout the lowland region, especially in that portion lying west of Toronto. Here too are extensive vineyards. Peaches and other varieties of fruit are successfully grown.

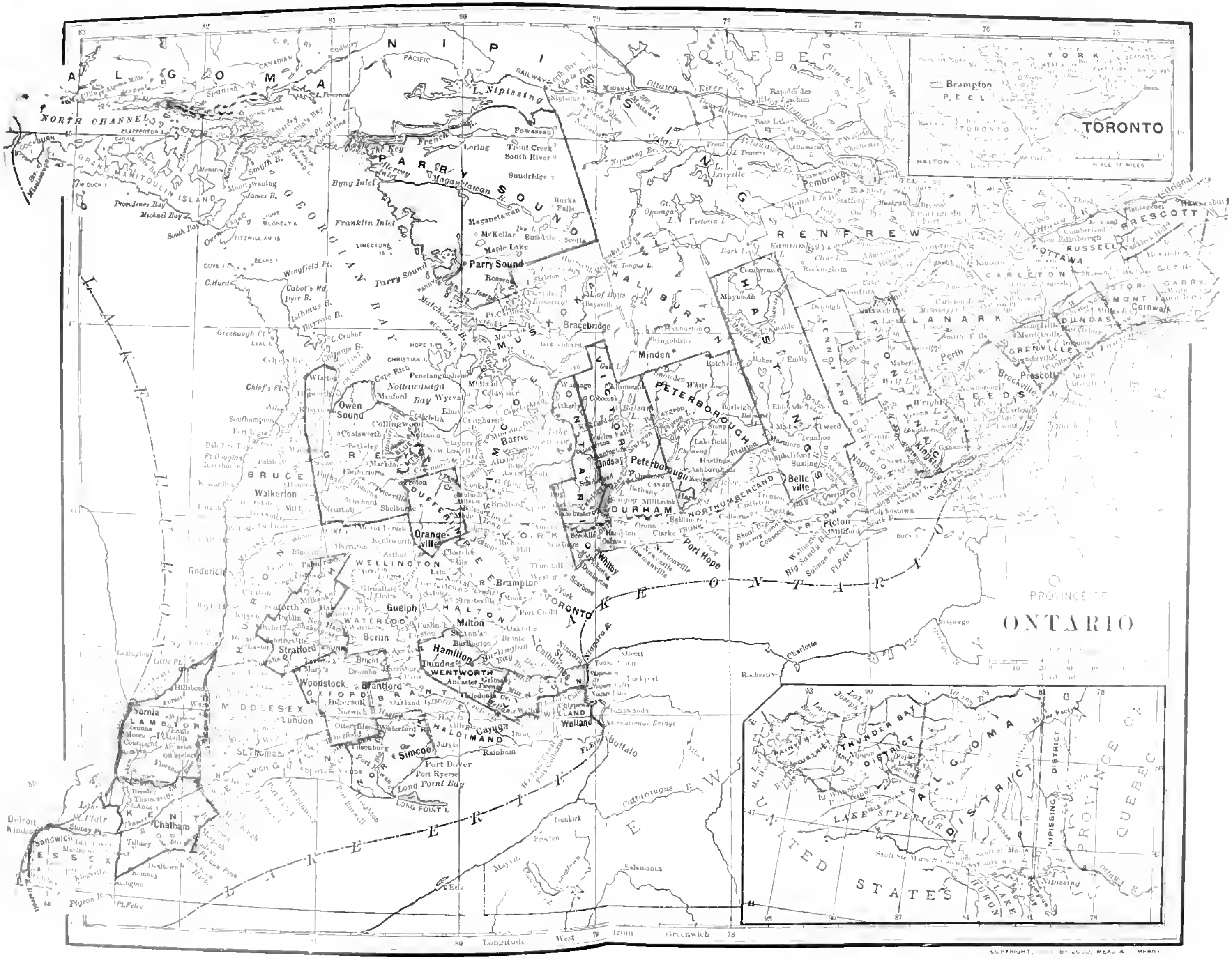
Stock-breeding is extensively carried on, and the province excels in the purity and quality of the various breeds raised. Cattle-raising receives the greatest attention; the number, constantly gaining, exceeded 2,400,000 in 1900. The number of sheep and swine is likewise increasing, each numbering about 1,700,000 in 1900. Horses show a decrease, the present number being about 600,000. Dairying is an important industry, the principal branch being cheese-making. In 1900 there were 1173 cheese factories, the value of whose products was $13,023,025. This industry is rapidly growing in prominence.

Manufactures. There are some important manufacturing industries in the province, though manufacturing is not generally well developed. Ship-building (wooden vessels) was formerly an important industry, owing to the great timber resources. These are now extensively drawn upon in the manufacture of doors, window frames, and furniture. Pork-packing and flour-milling are each of some importance. Few countries have at hand such an abundance of water power. The Ottawa River and almost every smaller stream in the province have important falls or rapids, not to speak of Niagara Falls and the rapids along the course of the Saint Lawrence. All these chief sources of power are being extensively utilized.

Transportation and Commerce. The Dominion, the provincial, and the various municipal governments have contributed liberally to the construction of railroads, and the mileage has rapidly increased until in 1900 it amounted to 6812 miles, or twice that of any other Canadian province, there being one mile of track to every 32.24 square miles of area. The greatest part of this is in peninsular Ontario, the Canadian Pacific being the only line which traverses the great northern portion of the province. At a number of points the railroads connect with those of the United States. The position of Ontario in relation to the Great Lakes and the Saint Lawrence River provides excellent water communication with the markets of the world. Formerly a number of falls and rapids greatly lessened the commercial advantages of these waterways; but the Provincial and Dominion governments have constructed a series of canals from Sault Sainte Marie in the north to Lachine Rapids in the east, so that it is now possible for vessels drawing 14 feet of water to pass from the head of Lake Superior through the whole course of the Saint Lawrence. The longest of these canals—the Welland, connecting Lake Erie with Lake Ontario—is 26¾ miles in length and cost over $24,000,000. The severity of the winter season stops navigation during that period, and will always detract greatly from the otherwise superior advantages of the navigable waters.

The province is rapidly increasing in commercial importance. The imports for home consumption during the year 1900 amounted to $70,200,000 as against $43,600,000 for the year 1890. Coal is the leading import. The duty collected has grown correspondingly, and in 1900 was $10,700,000. The exports for the same year amounted to $56,100,000. The foreign trade of the province is principally with the United States and England. The merchant marine in 1900 consisted of 1064 steamers and 546 sailing vessels, with a combined tonnage of 141,112.

Banks. In 1900 the chartered banks and bank branches of the province numbered 306. The post-office savings banks numbered 487, having 101,000 depositors, and $23,637,000 on de-


PROVINCE OF
ONTARIO
TORONTO
Brampton
PEEL
HALTON
ALGOMA
NIPISSING
PARRY SOUND
GEORGIAN BAY
MANITOULIN ISLAND
NORTH CHANNEL
LAKE HURON
LAKE ONTARIO
LAKE ERIE
QUEBEC
RENFREW
PRESCOTT
RUSSELL
CARLETON
LANARK
GRENVILLE
LEEDS
DUNDAS
FRONTENAC
LENNOX AND ADDINGTON
HASTINGS
PETERBOROUGH
VICTORIA
HALIBURTON
MUSKOKA
SIMCOE
GREY
BRUCE
DUFFERIN
WELLINGTON
WATERLOO
OXFORD
MIDDLESEX
LAMBTON
KENT
ESSEX
ELGIN
NORFOLK
HALDIMAND
WENTWORTH
BRANT
WELLAND
DURHAM
NORTHUMBERLAND
YORK
ONTARIO
Pembroke
Ottawa
Cornwall
Kingston
Brockville
Prescott
Belleville
Picton
Peterborough
Port Hope
Whitby
Barrie
Orangeville
Owen Sound
Walkerton
Goderich
Guelph
Berlin
Stratford
Woodstock
Brantford
Hamilton
Milton
St. Catharines
Welland
Cayuga
Simcoe
London
St. Thomas
Sarnia
Chatham
Sandwich
Windsor
Detroit
Buffalo
Rochester
Parry Sound
Bracebridge
Minden
Lindsay
THUNDER BAY DISTRICT
ALGOMA DISTRICT
NIPISSING DISTRICT
LAKE SUPERIOR
UNITED STATES
PROVINCE OF QUEBEC
Longitude West from Greenwich

posit. There was also one Government savings bank.

GOVERNMENT. The relation between the Provincial and the Dominion governments is somewhat similar to that between the States and the United States—matters of general interest being left to the Dominion Government. See CANADA.

The Provincial Government is administered by a Lieutenant-Governor, appointed by the Governor-General of the Dominion with the advice of the Prime Minister for five years. He is assisted by an executive council of eight members, which includes an attorney-general, commissioner of agriculture, secretary, registrar, treasurer, commissioner of Crown lands, commissioner of public works, and minister of education. The legislative assembly has only one House of 98 elective members. Voting is by ballot, and there is manhood suffrage limited by residence and citizenship. The judicial power is vested in a superior court of judicature, consisting of the High Court of Justice (with King's Bench, Common Pleas, and Chancery courts), and the Court of Appeal. In the Dominion Parliament the Province of Ontario is represented by 24 Senators and 92 members of the House of Commons.

The division of the province for purposes of local government is similar to the system found in the United States. The organized portion is divided into counties, and these are subdivided into townships. The more densely populated groups are classified according to size into villages, towns, and cities. The governing body in each of these units of government consists of an elective council. There are also administrative officers.

FINANCE. General property taxes are levied only for local purposes, the Provincial Government having sufficient income from other sources to meet all expenses and keep free from indebtedness. The two main sources of the provincial revenues are the Dominion subsidy (see CANADA) and the revenue from the Crown lands—a commission being charged for the privilege to cut timber in the forests, and dues also being collected on the amount cut. Other important sources of revenue are the liquor licenses, the collateral inheritance tax, the sale of law stamps, and (recently) the revenue from the mines. The cost of the Provincial Government since confederation has averaged a little over $3,000,000 annually. The province extends certain aids to the county municipalities, as, for instance, in the administration of justice. The law places a maximum limit upon the local tax rates, and a proposal to make a permanent debt must receive the sanction of the people. The support of public institutions constitutes the largest item of provincial expenditure, especially the charitable institutions, the Government meeting the expenses in whole or in part incurred in the care of the deaf, blind, or insane to the number of 4000.

POPULATION. Ontario, with 2,182,947 inhabitants (1901), is the most populous province of Canada, and contains about two-fifths of the total population of the Dominion. Formerly the inhabitants were centred almost wholly in the Ottawa and peninsular portions of the province, but the census of 1901 shows a decrease in almost all the counties of this region, which, however, has been more than balanced by the increase in the mining districts north of lakes Huron and Superior. The total increase for the decade 1891-1901 was less than $2\frac{1}{2}$ per cent. The birth rate is not low, but the province loses heavily through emigration. The large majority of the population is of English descent, though the Scotch predominate in the counties of Bruce, Grey, and Glengary. The German, Irish, and some other nationalities are represented in Toronto, and the negroes in the Niagara peninsula. The early development of Ontario profited from the migration of New England opponents of the War of 1812.

The census of 1901 returned the population of the largest cities as follows: Toronto, the capital, 208,040; Ottawa, 59,928; Hamilton, 52,634; London, 37,981; Kingston, 17,961; Brantford, 16,619; Windsor, 12,153; Guelph, 9959; Saint Catharines, 9946; Berlin, 9747; Belleville, 9117; Chatham, 9068.

INDIANS. The number of Indians is estimated at 20,700. The Government furnishes educational advantages for the Indian children, and the Indian is generally adopting agricultural and other occupations characteristic of civilized life.

RELIGION. There is no State Church, and all the churches are supported on the voluntary principle. The province is strongly Protestant, the ratio between the Protestants and Catholics being about 5 to 1. Of the Protestant denominations, the Methodists lead, followed by the Presbyterians, Episcopalians, and Baptists in the order named. The several bodies of Methodists have been united into one church, as have been also the several bodies of Presbyterians.

EDUCATION. Great attention is given to education, and the educational system is complete in scope, progressive in spirit, and efficient in administration. The taxpayers elect local boards of trustees, who have immediate control of the schools, but they are administered in accordance with the general regulations of the Minister of Education, and all follow a uniform course of study, use the same text-books, and are taught by teachers who have passed the provincial examination. The schools are free, and attendance is compulsory. Under certain conditions both Catholics and Protestants may establish separate schools which will be supported from the public taxes and appropriations (such schools continuing under the control of the Minister of Education). The exercise of this privilege, however, has not become common, nearly nine-tenths of the school children attending the unsectarian schools. Since 1898 the province has expended an average exceeding $9 per pupil of the total attendance. About two-thirds of this is raised by local taxes, the greater part of the remainder being the income from lands originally set apart as clergy reserves or for school purposes, and the smaller part being the annual legislative grant. There are additional aids to 'poor sections,' and the policy of pensioning superannuated teachers has long been in vogue. All the schools are in the hands of trained teachers, two-thirds of whom are females, the Government having provided for their training through the maintenance of 55 county model schools, two normal schools, and one normal college. The breadth of the public school system is shown in that it extends from the kindergartens (of which there are 119) to the university, and includes (besides

those mentioned above) high schools, night schools, and an agricultural college, the last being located at Guelph. Instruction in agriculture is becoming common in the rural schools. The school course provides the rudiments of a business education, and manual training is being introduced. Toronto University and College is at the head of the provincial school system, and has affiliated with it a number of denominational institutions, including Saint Michael's College (Catholic), Wycliffe College and Huron College (Episcopalian), Knox College (Presbyterian), and Victoria University (Methodist). There are a number of other private and sectarian colleges in the province, including the historic Upper Canada College, located at Toronto.

History. Champlain in 1615 was the first European to explore the region; by his alliance with the native Hurons he precipitated the war which led to their almost total annihilation by the Iroquois or Five Nations. In 1671 the French laid claim to the Lake Huron district; eight years later Niagara was settled by La Salle; and in 1749 Fort Rouillé, a French trading station, was established on the present site of Toronto. With the rest of Canada, the region was ceded to Great Britain in 1763 by the Treaty of Paris (q.v.), and formed part of the Province of Quebec. Its permanent settlement dates from the immigration of American Tories during the American Revolution and after its close in 1783. It became the Province of Upper Canada with a separate elective assembly in 1791; in the War of 1812 it was the scene of numerous Anglo-American conflicts, notably the battles of the Thames and Lundy's Lane; it was reunited with Quebec in 1841, in consequence of long continued political discontent and the rebellion fomented in 1837 by William Lyon Mackenzie (q.v.); in 1867 it received its present name, and again became an independent province in the newly organized Dominion of Canada. See Canada.

Bibliography. Selwyn and Dawson, *Descriptive Sketch of the Physical Geography and Geology of Canada* (Montreal, 1884); McIlwraith, *Birds of Ontario* (Hamilton, 1887); *Ontario Bureau of Industries Annual Reports* (Toronto); Millar, *Educational Systems of the Province of Ontario* (ib., 1893); *Geological Survey of Ontario* (Ottawa, annually); McMullen, *History of Canada* (London, 1868); Lindsey, *Life and Times of William Lyon Mackenzie* (Toronto, 1862); Dent, *Story of the Upper Canadian Rebellion* (ib., 1885); Morgan, *Bibliotheca Canadensis* (Ottawa, 1898).

ONTARIO, Lake. The most eastern and the smallest of the five great lakes of North America. It lies between latitudes 43° 10′ and 44° 8′ N., and longitudes 76° 30′ and 80° W., and is enclosed by the Canadian Province of Ontario and New York State (Map: United States, K 2). With a water surface of 7240 miles, it is less than one-fourth as large as Lake Superior. It is 190 miles long, 55 wide in its widest part, and about 480 miles in circumference. Its distinctive hydrographic basin is 28,840 square miles in area. The mean elevation of its surface is 247 feet above tide water in the Atlantic, its maximum depth is 738 feet, its approximate mean depth is 300 feet, and the depth of its basin below the sea level is 491 feet, the bottom of the lake being lower in relation to sea level than that of any other of the Great Lakes. The water discharge of the Saint Lawrence basin has been found to be slightly less than half its rainfall; Lake Ontario, lying at the foot of the chain of lakes, has naturally the largest discharge, 300,000 cubic feet per second, as compared with 265,000 for Lake Erie, 235,000 for lakes Huron and Michigan, and 86,000 for Lake Superior. The lake is sufficiently deep throughout for vessels of the largest tonnage. Its shores are generally very flat and have little attractive scenery, except in the bay of Quinte, a long, crooked arm, which extends about 50 miles into the land, on the northeast side of the lake. The lake freezes only a few miles from the shore, which is due in part to the frequent agitation of its waters by violent storms, and also to a persistent surface current established through its centre which moves to the east with return currents and eddies along the shores and about the islands. This surface current is due to the fact that the larger axis of the lake coincides with the direction of the prevailing westerly winds. There are many convenient harbors and thriving ports, chief among which are Kingston, Port Hope, Cobourg, Toronto, and Hamilton on the Canadian shore, and Oswego, Sacketts Harbor, and Charlotte in New York. Many lighthouses along the coasts facilitate navigation, and the lake is connected with Lake Erie by the Welland Canal, with the Erie Canal and the Hudson River by the Oswego Canal, and with the Ottawa River by the Rideau Canal.

ONTENIENTE, ôn'tâ-nê-ān'tâ. A town of Eastern Spain, in the Province of Valencia, 45 miles south of Valencia, on a branch of the railroad between Valencia and Madrid (Map: Spain, E 3). It was formerly fortified. Linen and woolen fabrics and paper are manufactured. Population, in 1900, 11,441.

ONTOG'ENY (from Gk. ὤν, *ōn*, being + -γένεια, *-geneia*, production, from γίγνεσθαι, *gignesthai*, to become). The development of the individual animal, in contrast to *phylogeny*, or the development of the entire class. The development of the individual is accomplished in a few hours, days, or years, at the most, while that of the order or class or phylum may extend through several geological ages, and is represented by a series of forms so related that they appear to be blood relations, and descendants from a primitive type. (See Phylogeny.) The ontogeny of any animal is the successive stages it passes through in the course of its development after the fertilization of the egg until it reaches maturity. Such a series of stages roughly corresponds to and epitomizes the development or phylogeny of the class.

ONTOL'OGY (from Gk. ὤν, *ōn*, being, pres. part. of εἶναι, *einai*, to be + -λογία, *-logia*, account, from λέγειν, *legein*, to say). A term applied to that department of metaphysics (q.v.) which deals with the ultimate nature of the universe conceived as being. With many philosophers ontology is made so inclusive as to be practically identical with metaphysics, but with others it is distinguished from other departments of that science, notably from teleology (q.v.).

O'NUS PROBAN'DI. See Burden of Proof.

ON'YX (Lat. *onyx*, from Gk. ὄνυξ, nail, veined gem, onyx, thickening in the cornea of the

eye; connected with Lat. *unguis*, O.Ir. *inga*, nail). A cryptocrystalline variety of quartz (q.v.), consisting of layers of chalcedony of different colors, usually white and black, or white and dark brown. The finest specimens of this mineral are brought from India, although it occurs in small quantities in many other localities, such as the Lake Superior region, and near the Bay of Fundy. It was highly esteemed by the ancients, who used it for ornamental purposes.

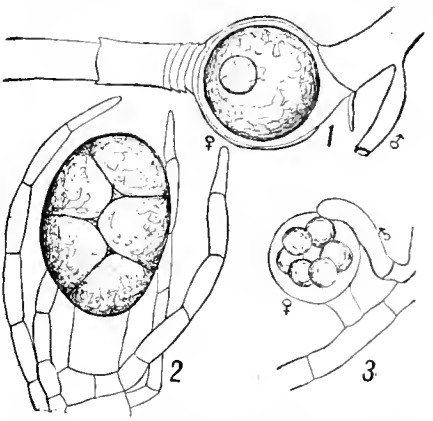
ONYX MARBLE. A beautiful ornamental stone composed chiefly of carbonate of lime colored by iron or manganese. This is the commercial variety of onyx, while true onyx is a banded variety of marble. Commercial onyx marble really includes two rock types, both of which are chemically deposited. The one is a hot-spring deposit or travertine, which is formed on the surface, the other is a cold-water deposit which is formed on the floor, roof, or walls of limestone caves in the same manner as stalagmites and stalactites. Owing to its method of formation, the cave onyx usually occurs in less extensive deposits than the travertine onyx marbles, which have been formed around springs, and both are far less extensive and less regular in their arrangement than the ordinary bedded limestones or marbles. The beautiful banding seen in onyx is due to the deposition of successive layers of carbonate of lime, while the colored cloudings and veinings are caused by metallic oxides, especially iron. The fact that onyx marble is colored along the veins or cracks is not necessarily due to an infiltration of the iron along these lines, but is caused by the iron carbonate in the stone being locally oxidized along the cracks. The cave onyx marbles are more coarsely crystalline and less translucent than the travertine onyx. Onyx marbles, although rarely occurring in large quantities, are widely distributed. The earliest worked deposits were probably those of Egypt, which were used by the ancients for the manufacture of ornamental articles and religious vessels. The Greeks and Romans also valued the material; the deposits near Urumiah and Yezd were extensively worked during the prosperous days of the Persian Empire. Many of the spring deposits occur in regions of recent volcanic activity and all of the known occurrences are of recent geological age. In the United States onyx marbles are said to occur in Arizona, California, and Colorado, but the American deposits have not been developed commercially to a large extent, most of the onyx used in the United States being obtained from Mexico, while small quantities are imported from Algeria and Egypt. The Mexican stone has for years been obtained chiefly from the vicinity of Pueblo and more recently from the vicinity of San Antonio. *Mexican onyx* is the name given to banded varieties of aragonite that are found extensively in Arizona, Missouri, and California, as well as in Tecali, Mexico. It is used for decorative purposes. The value of onyx varies considerably, the poorer grades selling for as little as 50 cents per cubic foot, while the higher grades bring $50 or more.

BIBLIOGRAPHY. DeKalb, "Onyx Marbles," in *Transactions of the American Institute of Mining Engineers* (New York, 1896); Merrill, *Stones for Building and Decoration* (2d ed., New York, 1897); Merrill, *The Onyx Marbles, Their Origin, Composition, and Uses, Both Ancient and Modern*, Annual Report of the United States National Museum (Washington, 1894); Merrill, "Onyx," in *Mineral Industry*, vol. ii. (New York, 1894).

OO, or **UHO**. One of the names of the Hawaiian feather-cloak bird. The bird is so called from its cry. See MOHO, and Plate of CREEPERS.

OODEYPORE, ōō'di-pōr'. Another spelling for Udaipur (q.v.), the name of a native State and city in India.

O'ÖGO'NIUM (Neo-Lat., from Gk. *ᾠογονεῖν*, *ōogonein*, to lay eggs, from *ᾠόν*, *ōon*, egg + *γονή*, *gonē*, generation). An organ in the algæ and fungi (thallophytes) which develops the eggs (oöspheres), hence the female sex organ. It is generally a single cell, but may bear accessory structures. The oögonium of the algæ was derived from a cell producing undifferentiated gametes (sex-cells). In the process of sexual evolution similar gametes became differentiated into eggs and



OÖGONIA IN, 1, ŒDOGONIUM; 2, FUCUS; 3, ACHLYA.

sperms; now the structure bearing the eggs is called the oögonium, and that developing the sperms ('antherozoids') the antheridium. The simplest and most primitive oögonia probably contained several eggs, although there are not now many illustrations of such conditions among the algæ. That is to say, the evolutionary tendency in the development of oögonia is to reduce the number of eggs until all of the protoplasm is devoted to one. Such highly differentiated oögonia are well illustrated in Vaucheria, Œdogonium, and Volvox. Chara and Coleochæte present further complications in the form of filaments that invest the cell containing the egg with a protective covering. The oögonia of fungi are in general similar to those of algæ, and indeed are believed in many cases to be directly derived from them. They are found chiefly in the group of the Phycomycetes, which is closely related to the algæ, but homologous structures are found in the Ascomycetes, although they generally bear the name of ascogonium or archicarp. The best illustrations of oögonia in the fungi are furnished by the water molds (Saprolegniales), and such well known genera as Albugo (Cystopus), Pythium, and Peronospora.

OO'JEIN'. A town of Malwa, Gwalior, Central India. See UJJAIN.

OOLACHAN, ōō'lä-kän, or **EULACHON**. See CANDLE-FISH.

OÖLITE, ō'ô-līt (from Gk. *ᾠόν, ōon,* egg + *λίθος, lithos,* stone). A term formerly used as synonymous with Jurassic, but now used to designate the middle and upper divisions of the Jurassic rocks, the lower division being called the Lias. In the United States the Oölite is of little importance, and in fact has only been identified along the Pacific coast, but in Europe it underlies a vast area, for during this period of geologic time there occurred one of the greatest encroachments of the sea over Europe and Asia which is known in geologic history. The rocks of the Oölite period are chiefly limestones. They are perhaps best known from their occurrence in the Jura Mountains of Switzerland, where the rocks have been bent into such beautiful folds as to attract the attention of the most casual observer. See JURASSIC SYSTEM.

OÖLOGY, ō-ŏl'ô-jĭ (from Gk. *ᾠόν, ōon,* egg + *-λογία, -logia,* account, from *λέγειν, legein,* to say). The science of eggs; especially the study of the breeding habits, nests, and eggs of birds; a branch of ornithology. Birds' eggs (q.v.) are conveniently classified as 'marked' and 'unmarked,' according to the ground color. Birds which lay their eggs in holes in trees or in the ground almost always have white, unspotted eggs, and they are frequently of a peculiarly smooth, translucent texture. Birds which build in trees generally have blue or greenish eggs, either spotted or unspotted, while birds that build in bushes, near the ground, are likely to lay speckled eggs. The shore-birds usually have the eggs heavily marked with dark brown on a yellowish background, while gulls and terns always lay heavily marked eggs. Ducks, geese, and herons lay unspotted eggs. Some birds lay only a single egg, and this is especially true of certain marine birds, such as auks, guillemots, and murres. Others lay two eggs, notably the humming-birds, while three, four, and five are the most common numbers. When the number is more than eighteen, there is reason to believe that more than one female has been concerned in the laying, as happens among ostriches and mound-birds. Gallinaceous birds and ducks, coots, and rails lay the largest number of eggs; the quail is said to lay eighteen, the coot fifteen, the wood duck fourteen, and the sora sixteen. There is no direct relation between the size of the bird and the size of the egg. The smallest eggs actually, and proportionately also, are those of humming-birds, which may be less than half an inch long by one-third of an inch wide. The largest eggs actually are those of the ostrich, but proportionately the eggs of the kiwi and mound-birds are much larger. Of North American birds, the largest eggs are probably those of the California condor, which are 4.5 × 2.5 inches. The swan lays an egg nearly as large, but does not breed within the United States. The great auk, though a much smaller bird than either of these, laid an egg 5 × 3 inches; but very few of them are now in existence. (See GAREFOWL.) The study of birds' nests is sometimes called *caliology,* as distinguished from oölogy proper. See NIDIFICATION.

Dr. Thomas M. Brewer (q.v.) may well be called the father of American oölogy, for his *North American Oölogy,* a quarto which appeared in 1857, was the first systematic work dealing with that subject published in this country. Unfortunately only one part of this was ever printed, but it is notable for its colored plates of birds' eggs. Capt. Charles E. Bendire (q.v.) became famous as an oölogist in the West, and in 1883 was appointed a curator in the National Museum. In July, 1892, appeared the first volume of his *Life Histories of North American Birds,* and the second volume appeared in September, 1896. They are quarto volumes of many hundred pages and numerous colored plates. An earlier descriptive work was Ernest Ingersoll's *Natural History of the Nests and Eggs of North American Birds,* of which seven 'parts,' describing the nidification of about 100 species of oscine birds, with colored plates of their eggs, were issued at Salem, Mass., in 1879-80. Other books dealing exclusively with American oölogy have been: Gentry, *Nests and Eggs of North American Birds* (Philadelphia, 1885); and Davie, *Nests and Eggs of North American Birds* (2d ed., Columbus, 1889). Several fine works describe the eggs of European and East Indian birds, of which one of the oldest and finest in English is Hewitson's (3d ed., London, 1856). For others consult Newton, *Dictionary of Birds* (London and New York, 1893-96). See EGG, and the accompanying colored plates.

OOMS, ōms, KAREL (1845-1900). A Belgian historical painter, born at Desschel, Province of Antwerp. He studied at the Antwerp Academy and under Nicaise de Keyser, and supplemented his artistic training by extensive travels through Holland, England, Germany, and Italy. His most important works include: "Philip II. Paying the Last Honors to Don Juan d'Austria," in the Antwerp Museum; "Forbidden Reading," Brussels Museum; "Innocence Protected by Law," Palais de Justice, Antwerp; "Last Days of Rubens" (1892); and "Christ and His Disciples on the Sea of Galilee" (1895).

OORI, ô-ō'rē, or **URI.** A river in Africa. See LIMPOPO.

OORIAL, ōō'rĭ-*al,* or **URIAL.** The name in the Punjab of a wild sheep (*Ovis Vignei*), called 'sha' in Ladak. It is a large, powerful species, which is to be found on the high mountains from Eastern Persia to Northern Tibet. The horns of the rams are heavy, rounded, much wrinkled, rise close together, and sweep around, so that in old specimens they almost complete a circle. A ruff of hair on the throat is usual. These wide-ranging and variable sheep are very wary and agile, and give the sportsmen a hard chase. The young are often captured, however, and wild bands often mingle with native sheep on remote hill-pastures. Consult: Blanford, *Fauna of British India: Mammals* (London, 1889); and writers upon natural history and sport in Central Asia. See Plate with WILD GOATS.

OORT, ōrt, HENRICUS (1836—). A Dutch biblical scholar, born at Eemnes. He studied theology at Leyden, preached at Santpoort, and, after two years teaching in the Amsterdam Athenæum, became professor of Hebrew language and archæology at Leyden. Oort edited the *Theologisch Tijdschrift,* and wrote: *De dienst der Baalim in Israël* (1864; Eng. trans. by Colenso, 1865); *Het menschenoffer in Israël* (1865); *Twaalf wonderspreuken van Jezus* (1870); *De Bijbel voor jonge lieden* (with Hooykaas, 1871; Eng. trans. by Wicksteed, 1873-79); *Evangelie en Talmud* (1881); *Atlas voor Bijbelsche en*

Kerkelijke geschiedenis (1884); and *Textus Hebraici Emendationes* (1900).

O'ÖSPHERE (from Gk. *ᾠόν, ōon*, egg + *σφαῖρα, sphaira*, ball). A general name given to the female sex-cell (gamete), and of course used only with heterogamous plants, in which the pairing gametes are unlike. It is the oösphere which upon fertilization becomes the oöspore (q.v.). The name is being abandoned for the simpler word 'egg.'

O'ÖSPORE (from Gk. *ᾠόν, ōon*, egg + *σπόρος, sporos*, seed). A general name given to the spore (in plants), which is the result of fertilization. Frequently the term is restricted to the sexual spores of heterogamous plants, that is, those whose pairing gametes are unlike (sperms and eggs). In this case the word 'zygospore' or 'zygote' is used for the sexual spore of isogamous plants, that is, those whose pairing gametes are alike. The oöspore is sometimes appropriately called the 'fertilized egg.' See FERTILIZATION; SPORE.

OOST, ōst, JAKOB VAN (1600-71) (called the Elder). A Dutch painter, born at Bruges. He studied under his brother, Frans van Oost, and then went to Italy, where he became an imitator of Annibale Carracci. In 1629 he returned to Bruges. His works are genre, historical, and portrait, and are to be found in many of the European galleries. His son JAKOB (1639-1713) was born at Bruges, and, after studying with his father, spent several years in Italy and went to Paris. He lived for more than forty years at Lille, where most of his works are to be seen.

OOSTEGITE, ō-ōs'tē-jīt. The name applied to the egg-case of certain crustaceans.

OOSTERHOUT, ō'stēr-hout. A town in the Province of North Brabant, Holland, 25 miles southeast of Rotterdam (Map: Netherlands, C 3). The handsome town hall, the great Roman Catholic church in the market place, and the Convent of Saint Catharine in the vicinity are among the town's notable edifices. The manufacturing establishments include beet-sugar refineries, tan-yards, potteries, shoe factories, and iron foundries, and there is an active trade in wood, linen, and agricultural products. Population, in 1889, 10,425; in 1899, 11,545.

OOTACAMUND, or **UTAKAMAND**, ut'ā-kā-mūnd'. A fashionable hill-town resort, and the summer headquarters of the Madras administration, in the Nilgiri Hills, Madras, British India, 36 miles northwest of Coimbatore, and 350 miles southwest of Madras (Map: India, C 6). A good macadam road, 12 miles long, leads from Coonoor, the nearest railway station. The town occupies a hill-encircled plateau 7228 feet above sea level, the surrounding hills, commanding views of magnificent scenery, attaining a maximum altitude of 8622 feet above sea level in Dodabetta on the east. The Government House, the public library, the Lawrence Asylum, with technical branches for soldiers' children, the churches of Saint Stephen and Saint Thomas, Victoria Hall, Assembly Rooms, Bruks Memorial School, the botanical gardens, recreation grounds, and the lake, one and one-half miles long, surrounded by a fine drive, are some of the principal features. In the neighborhood are numerous tea, coffee, cinchona, and eucalyptus plantations. The mean annual temperature is 55° F. Population, in 1891, 15,100.

OOTRUM (Dravidian *ōtrum*). A fibre derived from the stem of *Dæmia extensa*, an East Indian shrubby climbing plant of the natural order Asclepiadaceæ. The fibre is soft, white, silky, and strong, and is regarded as a promising substitute for flax. In some parts of the Deccan the plant is a troublesome weed.

OOZE. The fine homogeneous sediment, like mud, but softer and more sticky, forming a plastic floury substance, which constitutes a large portion of the bottom in the deeper parts of the ocean. As this ooze is principally made up of the shells of *Globigerina bulloides*, a surface foraminifer, it is generally called 'globigerina ooze.' As early as 1850 Pourtales stated that at depths of 257 fathoms "Globigerinæ are still living in immense numbers." He stated that at great depths in the strait of Florida the bottom is covered by a chalk-like layer, which resolves itself into a mass of Foraminifera, and their fragments more or less comminuted. This formation extends, he says, almost uninterruptedly in the whole bed of the Gulf Stream, in the greater depths of the Gulf of Mexico, in the deep channels which intersect the Bahama Banks, and then up the Atlantic coast from about the 100-fathom curve outward, or from the inner limit of the Gulf Stream, which nearly coincides with it, and so over the greater part of the Atlantic basin. The discovery of this formation belongs to the year 1853, when it was found almost simultaneously by Lieutenants Craven and Maffit, then in the Coast Survey, and exploring the Gulf Stream. It became more extensively known somewhat later by the soundings made for the Atlantic telegraph. The Foraminifera most abundantly represented in this bottom are of the genus Globigerina. Then occurs in order of frequency *Rotalina cultrata;* then several Textulariæ, Marginulinæ, etc. It is now pretty generally admitted that these rhizopods live and die in these great depths. But that animals living near the surface also contribute a large proportion is proved by the numerous shells of mollusks, teeth of fishes, etc., contained in it. The *Challenger* expedition explorations established that the pelagic bottom deposits are not derived from the shores of the continent, but are formed in the deep water of the central regions of the great ocean basins, and consist of organic oozes and a reddish clay. They are chiefly made up of the calcareous and siliceous remains of organisms that have fallen to the bottom from the surface waters, along with clay and volcanic débris in a more or less advanced state of decomposition. There is little or no trace of mechanical action on their components, their accumulation is relatively slow, and among them there do not appear to be any accumulations of materials identical with the marine stratified rocks of the continental areas. It seems doubtful, says Murray, whether the deposits of the abyssmal areas have in the past taken any part in the formation of the existing continental masses.

A 'pteropod ooze' is met with in depths of less than 2000 fathoms in the tropics, and is very largely made up of pteropod and heteropod shells, which also exist in considerable numbers in the deposits around oceanic and other islands.

In 'radiolarian' and 'diatom' oozes the deposits consist of siliceous skeletons and frustules of surface organisms, which have likewise fallen from the surface waters. A radiolarian ooze has hitherto been met with only in the deepest waters of the western and central Pacific, and diatom ooze appears to be confined to the Southern Ocean, a little north of the Antarctic Circle.

Thus it will be seen, as Agassiz has pointed out, that the character of a marine deposit is largely determined by its distance from land, and again by the nature of the organisms living in the surface waters. The dead shells of pteropods, foraminifers, radiolarians, and diatoms are heaped up on the bottom, some in one part of the ocean, some in another; and as no other materials reach these distant regions to cover them, they form characteristic deposits. Depth is, however, an important factor in reference to the composition of a deposit in any locality. There seems to be now no doubt that the whole of the carbonate-of-lime shells, such as those of mollusks and foraminifers, are entirely removed by solution in very deep water during their fall from the surface to the bottom, or immediately after reaching the bottom. It is found that, with increasing depth, the pteropod and heteropod shells are the first to disappear from deposits, then the more delicate surface foraminifers, and finally the larger and heavier ones. It is likewise observed that, the more numerous these shells are in the surface waters, the greater is the depth at which they will accumulate at the bottom. As a rule, a pteropod ooze or a globigerina ooze is found in deeper water in the tropics than in temperate regions.

It must be remembered that all the bottom deposits merge into one another, and at times it is difficult to say whether a deposit should be called a red clay, or a radiolarian ooze, or a globigerina ooze, or a blue mud. It was thought by Pourtales and others that the Globigerina lived in the oozes at the sea-bottom; but the *Challenger* observations have clearly established that many foraminifers have a pelagic mode of life (see PELAGIC ANIMALS), flourishing in the pure currents of the open ocean, nearly all the species being confined to tropical and subtropical waters. There are not more than twenty or twenty-two species of pelagic Foraminifera; yet, says Murray, so numerous are the individuals of the species that they usually make up over 90 per cent. of the carbonate of lime present in the calcareous oozes of the abysmal regions. The individuals belonging to even a dozen of these species far outnumber the individuals belonging to all the other known genera and species of Foraminifera. This is true not only with regard to their abundance in the deep-sea deposits of the present period, but also to their great development in Tertiary and other geological formations. Murray adds that the species of Foraminifera which live on the bottom in deep water "are habitually under very uniform conditions, and consequently their shells do not vary in size and thickness with change of latitude like those of the pelagic species, the animals of which are subject to great changes of temperature and salinity in the surface waters."

BIBLIOGRAPHY. Pourtales, in *Report of the United States Coast Survey*, for 1853; Agassiz, *Three Cruises of the Blake* (Cambridge, 1888); Murray, *Report on the Scientific Results of the Voyage of H. M. S. Challenger. Deep Sea Deposits* (London, 1891).

O'PAH, or KINGFISH. A beautiful and palatable fish (*Lampris luna*) of the Mariposa family (Lampridæ) and related to the John Dory (q.v.). It abounds in most northern waters, but is rare on the American Atlantic coast. It grows to a length of four feet or more, is of oval form (see Colored Plate of GAME FISHES, with TROUT), with a high dorsal fin and a powerful tail. It is brilliantly colored: the upper part of the back and sides rich green, reflecting purple and gold in different lights, the lower parts yellowish-green; round yellowish-white spots above and below the lateral line; all the fins bright vermilion. The flesh is much esteemed. This fish has many names, as 'mariposa,' 'moon-fish,' and 'king of the herrings.' Consult Hamilton, "British Fishes," in *Naturalist's Library* (London, undated).

OPAL (Fr. *opale*, from Lat. *opalus*, from Gk. ὀπάλλιος, *opallios*, opal; connected with Skt. *upala*, stone, upper millstone). A hydrous mineral silicon dioxide used as a gem. It differs from quartz by containing water, the quantity of which varies from 2 to 13 per cent. and even more. It occurs usually in pale shades of yellow, red, green, and blue, although sometimes the color is quite dark, the coloration depending on different oxides and frequently showing a brilliant play in the light. Opal is never found crystallized and has a conchoidal fracture, being easily broken. Among the ancients this mineral was held precious and regarded as a lucky stone. In the East the opal is believed to make its wearer beloved of God and man so long as he trusts sincerely in its power. The finest opal is said to be among the Austrian crown jewels. It weighs seventeen ounces and is five inches long by two and a half inches in width. The principal varieties of the opal are: (1) The precious opal; (2) fire opal; (3) girasol; (4) common opal. The precious opal, called also noble opal, and sometimes oriental opal, is semi-transparent or translucent, usually of a bluish or yellowish-white color, yellow by transmitted light, and exhibits a beautiful play of colors, due to minute fissures which, being filled with air and moisture, reflect all prismatic colors. This variety is used principally as a gem-stone and is polished with a convex surface because its play of color is best shown in that way; but it is never cut into facets, because of its brittleness. The finest specimens are found near Kaschau, in Hungary, where they occur disseminated in the conglomerate; also in Saxony, in Honduras, in South America, Queensland, and New South Wales in Australia, and especially near Querétaro, in Mexico; also at various localities in Oregon and Washington in the United States. The fire opal, which is of a hyacinth red color, with yellow and green reflections, occurs at Simapan, in Mexico, and also in Honduras. The girasol, which is bluish-white in color with reddish reflections in a bright light, also occurs chiefly in Mexico and Central America. The common opal is semi-transparent and may be watery-white, yellow, green, red, or brown; it exhibits no play of colors. It is found in Hungary, in various localities in Germany, in Cornwall, Pa., Idaho Springs, Colo., in Calaveras County, Cal., and elsewhere. Wood opal is

petrified wood showing the original form and structure. Hyalite, or Müller's glass, is a colorless or whitish variety of opal, while menilite is an opaque grayish variety which is frequently found in concretionary form.

OPATA, ō-pä'tä ('Enemies,' so called by the Pima, with whom they were anciently at war). An important tribe of Piman stock (q.v.) occupying the mountainous region on the headwaters of the Yaqui River in Sonora and the adjacent portions of Chihuahua, Mexico. Like all the tribes of Piman affinity, their traditions indicate a northern origin. When first known to the Spaniards they were found occupying settled villages of adobe huts, and cultivating fields of corn and other vegetables. They are brave and faithful, for which reason they have been extensively employed by the Spanish and Mexican governments as soldiers and frontier guards. They readily accepted the teachings of the missionaries and are now all Christianized, although still governed under the ancient forms by their village chiefs. In 1820, owing to neglect and abuse from Mexican army officers, under whom they served, their warriors revolted. Under their chiefs, Doraine and Espiritu, they defeated several expeditions sent against them, making a final stand in an adobe church against a force of 2000 Mexican troops until their ammunition was exhausted, when they were obliged to surrender. The two leaders and seventeen others were shot, but the abuses of which they complained were corrected, and they have since remained quiet and loyal. They number now about 5000.

OPDYCKE, ōp'dik, Emerson (1830-84). An American soldier, born in Hubbard, Trumbull County, Ohio. In July, 1861, he enlisted as first lieutenant in the Forty-first Ohio Volunteers, and was soon afterwards promoted to be captain. In January, 1863, he became colonel of the 125th Ohio. At Chickamauga his regiment lost one-third of its number; at Missionary Ridge his command was one of the first to reach the Confederate works; and at Franklin (q.v.) a timely charge of his brigade by his orders restored the Federal line broken by Cleburne's charge, and prevented what might otherwise have been a great disaster. He was made brigadier-general of volunteers in 1865, and in 1866 was brevetted major-general of volunteers to date from the battle of Franklin. After his resignation, in 1866, he entered business in New York City.

O'PECHANCA'NO. A chief of the Powhatan Indian confederacy of Virginia, succeeding the famous Powhatan, who died in 1618. He acted as mediator in preventing hostilities in consequence of the abduction of Pocahontas by the English in 1613, but on his succession to authority soon gave indication of settled dislike to the whites. Under cover of professions of friendship he united nearly all the tribes of tidewater Virginia into a conspiracy against the English, and on March 22, 1622, a simultaneous attack was made on all the scattered settlements, resulting in the massacre of 347 men, women, and children, or more than one-fourth of the whole white population of the colony. Jamestown alone escaped, through the timely warning of a friendly Indian. The war thus begun continued until both sides were exhausted, when a peace was made which endured for over twenty years. As the English settlements advanced the Indians were steadily pressed back from their old-time fields and fishing grounds until in 1644 Opechancano, now grown old and nearly blind, determined to make a last stand for his people. In another concerted attack along the frontier 300 English settlers perished. By this time, however, the whites had greatly increased in number, while the Indians had correspondingly diminished. A war of extermination was ordered and kept up for two years, the Indians being hunted down like wild beasts, without rest or quarter. In 1646 it was brought to an end by the capture of Opechancano by an expedition led by Governor Berkeley in person. The chief was taken to Jamestown, where he was soon afterwards shot and killed by the sentry appointed to guard him.

OPELIKA, ōp'ē-lī'kä. A city and the county-seat of Lee County, Ala., 29 miles northwest of Columbus, Ga.; on the Western of Alabama and the Central of Georgia railroads (Map: Alabama, D 3). It is an important cotton market, owing to its location in a productive cotton section, for which it is also a distributing centre. There are cotton gins, cotton mills, flouring mills, fertilizer works, brick plants, etc., the products of the town's various establishments, according to the census of 1900, being valued at $335,000. Opelika, settled about 1840, is governed, under a charter of 1896, by a mayor, elected biennially, and a council. Population, in 1890, 3703; in 1900, 4245.

OPELOUSAS, ōp'ē-lōō'sas. A town and the parish seat of Saint Landry Parish, La., 125 miles west by north of New Orleans; on the Bayou Teche, and on the Southern Pacific Railroad (Map: Louisiana, C 3). It has the Academy and Convent of the Immaculate Conception, and a free reference library of 1000 volumes is connected with the high school. There are a cotton compress, cottonseed oil and rice mills, and other industrial establishments. Population, in 1890, 1572; in 1900, 2951.

OPEN-BILL. Either of two species of East Indian and African storks of the genus Anastomus, remarkable for the structure of the bill, the mandibles being in contact only at the base and tip, with a wide interval between their edges for some distance near the tip. They frequent the seacoast and rivers, and feed chiefly on mollusks.

OPEN CHURCH. See Institutional Church.

OPEN DOOR. A term in international politics which came into general use in 1899, and has reference to the equality of commercial opportunity in China to all nations. The enunciation of the open-door policy had its origin in the acquisition by various European Powers of commercial ports in China and the insistence of the United States that such ports should be open to all the world on equal terms.

OPEN-FIELD (or Common-Field) **SYSTEM.** The term used to designate the scheme of agriculture which prevailed in England and other countries during the Mediæval period. At this time the rural population was grouped together in villages, either free or manorial, in which every man had his house with a small plot of ground about it, while around the village lay the plowed fields, the meadows, pastures, and for-

ests. The arable land was that to which the term under discussion is applied. It was divided as nearly as possible into three—or some multiple of three—equal fields, in each of which every man in the village had a certain share. The system had two distinctive features. In the first place, a man's holding in each field did not consist of one compact plot of ground, but was made up of several strips, each about an acre in size. Narrow strips of grass were the only boundary lines; hence the name open field. The second feature of the system was the rotation of crops. Every third year one of the fields was left to lie fallow. What crop it should bear the other two years was also regulated by custom. Survivals of the open-field system are present in English agricultural life to-day; in fact, during the nineteenth century more open fields were inclosed than had ever been inclosed in a like period before.

OPEN, SESAME, sēs'a-mē. In the story of Ali Baba in the *Arabian Nights*, the magic formula which opens the door of the thieves' cave.

OPEQUAN, ō-pēk'ăn, **CREEK,** Battle of. See Winchester.

OPERA (It., composition, from Lat. *opera*, work; connected with *opus*, Skt. *apas*, work). A musical form of stage-play. The Athenian drama was grand-parent to the opera. When that artistic reform, the Renaissance, swept Italy it stamped its influence on each one of the fine arts; it was a universal harking back to the period of the classics. The arts that had idled along through the Middle Ages were reanimated with the breath of classicism; but music alone was an exception to the rest. It was the youngest of the arts and differed by nature from the others in that it was not imitative. While its development was steady from about the tenth century on, this progress was almost entirely free from the influences of ancient models, and on lines dictated by evolution itself. One of the prevailing symptoms of the Italian Renaissance was complete dissatisfaction with art as it stood. It was easy enough to reconstruct the ideals of the other arts: there were tangible models to imitate; but none of these served the cause of music. Out of the hazy past came confusing echoes of the Greek drama, a combination of poetry, music, and the dance, and this was adopted as the ideal plan upon which to reconstruct music. Their choice seemed logical enough to the crew of reformers who went to Greece for most of its formulæ; but when it is considered that they knew little of the actual use to which music was put during those days of Athenian art, it must appear as a step in the dark. Remarkably enough, it was a step in the right direction; a step which, modernized and made practicable, afterwards led opera out of a discouraging tangle of half-hearted theories and ill-assorted experiments to a point of artistic culmination.

Previous to the real beginnings of opera there were plays to which in one manner and another music was linked. There were costumes, scenery, and action—all these displayed on a stage; and the trend was sometimes dramatically or sentimentally pastoral, frequently comic. Adam de la Halle (c.1235-c.1287) composed a dramatic pastoral called *Le jeu de Robin et de Marion* for the French Court at Naples, produced there about 1285, which has been mistaken for the actual starting point of opera. In reality it was nothing more than a string of ballads, popular in that day, joined by a dialogue; and as Halle wrote only the latter, his fame as a composer is almost erased. There were many other efforts of this kind, none of which had a direct influence on the opera of the future. The plight of the serious composer striving then for a vehicle of dramatic utterance was pitiable. The folk-song or ballad could not be taken seriously by him as it stood: all his training had taught him to honor only the complex art of polyphonic writing, which is melody multiplied, in which the different voices interwove and crossed each other. He might—and did—take folk-song as material about which to weave his counterpoint. This bred new troubles, since such a procedure could not endure the test of dramatic action: several voices singing in counterpoint scarcely could be made to stand for the dramatic utterance of a single person. So he dared such experiments only in the unexacting domain of the concert room. Another claim for attention comes from the ballet of that period, especially in France. Besides the grandeur of the scale on which these entertainments were carried out, the plots were sufficiently important dramatically to cause some historians to believe this the beginning of opera. We, from our point of vantage, can see now the theoretical errors of all these attempts; but they were seen long ago by a band of enthusiasts.

Toward the end of the sixteenth century there assembled a number of Florentine noblemen determined to free dramatic music from its trammels. They have gone down in history as *La Camerata*, and the circle was composed of Bardi, Strozzi, Galilei—father of the famous astronomer—and Corsi. With these amateurs there consorted Ottavio Rinuccini, a poet, and the two musicians Jacopo Peri (c.1560-1630) and Giulio Caccini (c.1558-1618). In pursuing their Hellenic ideal of reconstructing music upon the principles of the Greek drama they ignored all the contrapuntal advance music had made during four centuries. The only task they set before themselves was to express in sounds the sentiments of the poet; and music as an independent art was discovered. What latitude this gave composers is easy to imagine; it also freed the voice so that it could work singly with an orchestral accompaniment. In a word, it was the first known attempt of merging the word and the sound into an individual whole. Theories grew into actuality when a performance of *Dafne* was celebrated at the Palace of Corsi in 1595. The libretto of this, the first opera, was by Rinuccini and the music by Peri; and it was written according to the formulæ of the *Camerata* in the *stile rappresentativo*—the 'expressive style.' *Dafne* was successfully performed several times, but always in private, and now the score is not discoverable. The public was initiated five years later when two settings of Rinuccini's *Eurydice* were made—one by Peri and the other by Caccini. Both operas were produced in part during the marriage celebrations of Henry IV. and Maria de' Medici at the Pitti Palace, October 6, 1600. These two operas embody the tentative strivings of the Florentine *Camerata* in their efforts to revive the drama of the Greeks. Measuring the accomplished thing by the ideal model the former must appear ridiculous and very

wide of the mark. But here at least was a step in an untrodden path: Opera was now on a basis which admitted of development. Its career had begun.

THE INFLUENCE OF ITALIAN OPERA.

How ripe Italy was for the music reform begun at Florence is proved by the eagerness with which other composers took up and utilized the *Camerata's* ideas. Fortunately for the fate of opera, some great musicians interested themselves in it; musicians who were bolder even than the brave spirits that had launched it. First among these was Claudio Monteverde (1567-1643), by the nature of things a pioneer. Several innovations are laid at his door, the most important to the development of opera being the breath of life he put into the lifeless recitatives of Peri and Caccini. This meant the bursting of another bond which had restrained dramatic freedom, and dramatic melody replaced the stilted recitatives. He was aided in these reforms by his contemporary Marco da Gagliano. When Monteverde's first opera, *Orfeo*, appeared in 1607 and his second one, *Arianna*, a year later, synchronous with Da Gagliano's *Dafne*, it was evident that Peri and his comrade had been left far in the rear. The individuality of the later composers asserted itself and in a short space of time opera had made a great bound for freedom. Of the three following decades few records remain to prove any great advance along the line of reform, a surprisingly large number of scores having been destroyed. But opera made a great advance in 1637 when the Teatro di San Cassiano —the first public opera house—was opened in Venice. Now that the masses had a voice in the matter, it soon became evident that the people must be pleased and the Florentine ideals forgotten. The nobleness of the libretti deteriorated, mythology gave way to history, and melodrama was king. The masses were pleased, and the business of opera flourished until there were eleven opera houses in Venice alone. The leading musical spirit of this Venetian opera period was Monteverde's pupil, Pietro Francesco Caletti-Bruni (c.1600-1676), who adopted the name of his noble patron, Cavalli. He was an excellent musician and did much to give Venice opera local color by introducing the spirit of jest in his works; he is even credited with the invention of the operatic aria, distinct from the *musica parlante* used by his predecessor. (See ARIA.) But the introduction of the aria was a disastrous move for the good of opera; it boded degeneration of serious opera and paved the way for the *opera buffa*. The same fate was threatening Neapolitan opera despite the composer-genius Francesco Provenzale (c.1610-?), when a new force stayed the decline of opera. The contemporary composers who had not bothered their heads about the stage had gone quietly about their business developing the other forms of music in which they were unhampered by scenic bounds. It stands to reason that their art was a purer one; so when one of these—Marc' Antonio Cesti (c.1620-69), pupil of the celebrated Carissimi—came to Venice at the middle of the seventeenth century he brought with him a remarkable technique and a lot of musical ideas. That the latter were for the most part badly suited to the demands of opera is true, but he made his mark on the map of operatic history by ousting the comic element from serious opera. Hereafter *opera seria* and *opera buffa* traveled different roads. The latter tumbled mightily from grace at first, but gradually its cause was championed by Nicolò Logroscino (c.1700-63), Pergolesi (1710-36), and Piccini (1728-1800), who reëstablished it on an artistic basis. Under the above-mentioned Cesti serious opera fared very badly. His intentions doubtless were good—he even is said to have invented the *da capo*, or repetition, of aria—but his training under Carissimi was all antagonistic to the principles of opera. He tried to reconcile opera and oratorio and what resulted was neither. The product was some unfortunate thing that had fallen between the two stools; opera became undramatic and unscenic—in a word, it became unoperatic.

Even so great a musician as Alessandro Scarlatti (1659-1725) could not rescue opera from its plight. His one striving was to develop the musical end of the form, and in his eagerness he neglected the dramatic entirely—just as so many other composers had done and were doing. This wretched period, which has been called the 'oratorio epoch' of opera, lasted until the stern Gluck reform set in. Italy had been too small to hold the effects of the Florentine movement, and Dresden produced a German version of *Dafne* about 1627. The composer was Heinrich Schütz, who had been trained in Venice under Gabrieli, whose work was an imitation of the Italian. Nuremberg cropped up with something which purported to be more Teutonic later. This was a lyric drama called *Seelewig*, by Staden (1607-55), which proved, after all, to have little of the national in it. It was evident that Germany could not get on without Italy in matters musical, so it was no surprise to find a wholesale importation of Italian composers, operas, and opera troupes into Germany about the middle of the seventeenth century. Nevertheless by 1678 Hamburg had a German opera house. The opening performances were mere farces of serious work and the scheme was too ridiculous to last. A betterment came in 1697 when Reinhard Keiser (1674-1739) produced his *Ismene*; from then until 1734 he was actively connected with the opera. He worked diligently to divorce opera from Italian influences and wrote German music; but unfortunately he planned his work in the forms of the Neapolitan 'oratorio-opera,' which had no artistic excuse for existence at all. So far opera 'made in Germany' was not a success, and with Keiser's death Italy again flooded the country with its musical product. The Italians also forced their way into France. Their early performances there may be passed over, being of no great importance in themselves; but they awakened in the Frenchman's mind the possibility of a national opera. This culminated with the accession of Louis XIV. to the throne, for he bestowed on Pierre Perrin (1620-75) the right to found an academy of music. A company was incorporated, and on August 19, 1671, the Académie Royale de Musique, which still exists, began its career with *Pomone*, a mediocre pastoral, the music by Cambert (1628-77). So here was the Italian influence dominant in France and resulting in the founding of an institution in imitation of the Florentine *Camerata*. Although Perrin and Cambert founded the Académie Royale de Musique, their activity at its head was short-lived. The father of French opera is Lully

(1633-87). Giovanni Battista Lully, a Florentine by birth, was taken to France and began his Parisian career as a scullion. His violin-playing, however, drew attention to him, and under noble patronage he began the study of music. As a musician he acquired dignity, knowledge, and power; he intrigued against Perrin and Cambert, and in short order was the head of the Académie. Here he ruled with a high hand, but his extraordinary and numerous talents made him a valuable person; he composed a large number of ballets, divertissements, and operas—in all of them pandering to the local taste and keeping the dramatic element well forward. Naturally his operas betray Italian influence, but this is neatly modified or cleverly disguised; above all they are adapted to the stage. His principal successor—and this after a lapse of time—was Jean Philippe Rameau (1683-1764), who was a better musician, but had not so keen an eye for the dramatic end of opera, and under his reign Italian opera once again secured a hold in France. It must be recorded to the glory of French pride that the Italians did not succeed—as in Germany—in overwhelming national opera; but the taste of the musical public was divided, and afterwards—as we shall see—culminated in the Gluck-Piccini contest for operatic honors.

In England opera had tentative beginnings as in every other country; here it was the masque (q.v.) that gave early excuses for the employment of music with stage productions. But this form was no nearer opera than the gorgeous French ballet had been and it founded no school. It remained for Henry Purcell (1658-95) to lay the corner-stone of English opera. He was probably the greatest of England's musicians—certainly the last of the great ones—and was a pupil of Pelham Humfrey, who in turn had studied under Lully. Much of his work consists in musical settings for plays, but there is at least one real opera, *Dido and Æneas*. The early death of Purcell was particularly unfortunate for England, inasmuch as there was no one to succeed him; and as art cannot remain stationary, it declined. This was the usual opportunity for Italy, whose musical scouts were constantly surveying the operatic field for fresh conquests. The most important of the invaders, however, was the German George Frederick Handel (1685-1759), who had become thoroughly Italianized. He wrote and produced opera after opera until he became bankrupt, and then he turned out oratorios with equal facility. That he had dramatic ability—other than a musical one—is extremely doubtful, and his operas belong unquestionably to that dread 'oratorio-opera' style inaugurated by Carissimi through Cesti. Handel did not have the English field to himself; his rivals were Buononcini (1660-1750) and Ariosti (1660-c.1740). The stringing of ballads—as Dr. Pepusch (1667-1752) did in the case of John Gay's *The Beggar's Opera*—does not deserve serious consideration in itself, but in England it gave rise to the school of ballad opera from which nearly all later attempts at English opera stem. How widespread the influence of Italian opera was has been shown; also that it was the kernel of national opera in England, France, and Germany. Even a cursory glance into the matter will prove that in the haste to cover all available territory and in the eagerness to please the several masses the Florentine ideals were buried under the numberless mounds of failure which opera had left in its trail of popularity. A reform was imminent.

GLUCK, THE REFORMER, AND MOZART, THE MELODIST.

Christoph Willibald Gluck (1714-87) was a dissenter from the very start. His musical training had been principally in the Italian school, but he realized many of its operatic insipidities and had determined even with his first work to cut loose from some of the foolish conventions into which opera had drifted. At first he aimed to give importance to the dramatic in the libretto by means of music—something which had been overlooked by the composers of ornamental opera for decades. This experiment was tried with *Artaserse*, which, oddly enough, came on the boards the same year that Handel's final opera appeared. It would be silly to contend that Gluck had 'found himself' straightway in his first opera; no composer has done that yet. In fact, he seems simply to have defied convention with no rules of his own save just this one of defiance. Now no system can grow on such a basis, and after writing several operas and traveling about, he began to lose interest in his work. He had met convention at every turn, and this constant attitude of fight on his own part wore him out. Eventually he conferred with an Italian poet, Calzabigi, and the two decided that the trouble of the entire operatic situation was that the prima donna had grown too vain and important—she dictated to the composer—and that the libretto of the day was lacking in dramatic element. This happened when Gluck was already forty-six years old, and certainly the weaknesses which he and the poet unearthed must have been known to both of them long before. But what followed was important. Calzabigi wrote a libretto on entirely new lines, and Gluck set it sincerely to music. This was *Orfeo ed Euridice*, brought out in 1762, the first attempt not only to forsake the 'oratorio' school of opera, but also to formulate a new plan by which opera might claim attention as an art form. Of course the public complained; but after a while the intelligent ones among them realized the earnestness of both poet and musician and were won over. The next opera from these pens, *Alceste*, was a further improvement on the previous one, as was *Paride ed Elena*. Gluck now attracted the attention of the French poet Du Rollet, connected with the French Embassy at Vienna, and the two set to work to make an opera out of Racine's *Iphigénie en Aulide*. Then Gluck longed for a Paris success, and through the influence of Marie Antoinette succeeded in securing an invitation to that city. His patron also succeeded in precipitating the innocent composer into a political quarrel by antagonizing Mme. Du Barry. However, Gluck's *Iphigénie* achieved a hearing and afterwards a success in Paris. In the wake of this came one of the bitterest fights in all operatic history. At the bottom of it politics raged, but on the surface it seemed a controversy over æsthetic ideals. It culminated by forming two violently antagonistic parties which pitted Gluck on the one hand against Piccini on the other. Many prominent persons took active share in the conflict, which was almost an international affair, since the outcome would control the fate of Italian opera. The two composers were duel-

ing with operas. Gluck composed *Armide*, and against that Piccini wrote *Roland*. So matters might have gone on indefinitely had it not been decided that both of them should set the same subject to music. This was *Iphigenie en Tauride*, and Gluck triumphed because of the superiority of his work. So dramatic verity and operatic sincerity won the day. The principles upon which Gluck had insisted and for which he had waged successful war were really only those formulated by the Florentine *Camerata* almost two centuries earlier. It is a tribute to the Florentine noblemen; though probably they builded better than they knew.

At this period the influence of Mozart (1756-91), the genius of melody, began to make itself felt. Except that he had a keen appreciation for the dramatic, he was the antithesis of Gluck. He had no regard for the precepts of his planning predecessor; those formulæ over which Gluck had slaved meant nothing to him, and he succeeded by virtue of sheer genius. He composed with the greatest ease and rapidity, and wrote masterpieces with less care than other composers devote to writing trash. Yet his *Don Giovanni* is one of the greatest of the older operas. He individualized his characters musically, was alive to dramatic situations, and inclosed the whole in a network of pure melody—perhaps the most exquisite ever produced. It was more Italian than the sunny, melodious product of that country, but it was controlled by a genius which shone through at every bar. When he wrote in the vein amusing—as in *Le nozze di Figaro*—it made the efforts of the Italians, who created this *genre*, sound flimsy and trivial. When he grew serious—as in the grewsome scenes of *Don Giovanni*—he foreshadowed the Wagner music drama. Yet with all these attributes Mozart himself did not change the current of the operatic stream nor did he found a school of successors. Nowhere in the history of opera is there a parallel to his case.

THE ITALIANS AND THE FRENCH.

While supplying the world with operas and composers, Italy grew careless of her product. Too great a prosperity usually breeds decadence, and the business of music is no exception: besides, the Italians were exporting their music and importing none. The fertility of every nation has an end. Soon poverty threatened musical Italy, though she produced some remarkable men. Domenica Cimarosa (1749-1801) was unfortunate in that he was followed by Rossini (1792-1868), whose operas soon displaced those of his less gifted predecessor. Rossini had the fertile gift of melody, but lacked the ambition to develop his gifts. He wrote melody and let the action look out for itself. This was a distinct step backward to the ante-Gluck period, and it is remarkable to note how rapidly the vices of the old Italian school sprang into life again and thrived. The flourish became the thing: the singer's agility was a virtue: the ear was tickled and the eye insulted. In lighter opera this did not matter so much, and Rossini left the world at least one masterpiece and a model in this form: *Il barbiere di Siviglia*. His successor, Giovanni Pacini (1796-1867), tried to stem the flippant tendency which crept into opera: but in this work he was overshadowed by both Gaetano Donizetti (1797-1848) and Vincenzo Bellini (1802-35), who slaved for the dramatic in opera. They achieved it, all the while flattering the public with the flourish to which Rossini had accustomed it. Save for a very few operas, such as *Don Pasquale*, *Lucia di Lammermoor*, and *Norma*, their names have disappeared from the roster of opera houses to-day. They lead the way to Verdi, however. He, on account of the masterly works of his last period, will be treated later. In France the Gluck theories of opera had been driven home so sensationally that they were not dislodged in a hurry. After Gluck's death the work was carried on by his pupils, Antonio Salieri (1750-1825), and Sacchini (1734-86), who kept alive his master's ideas without accomplishing anything remarkable himself. Then come the stately Cherubini (1760-1842), and Gasparo Spontini (1774-1851), who has been called the last classicist of the lyric stage. Soon afterwards, Auber (1782-1871), who had previously worked for the Opéra-Comique, sprang into the arena of grand opera with *La muette de Portici*, also known as *Masaniello*, and sent Gluck classic traditions flying. This shock was still upon the people when Rossini's *Guillaume Tell* appeared—the most pretentious work attempted by this composer—and then the Romantic Period of 1830 possessed the Parisians heart and soul, bringing with it a lordly figure in the history of opera—Giacomo Meyerbeer (1791-1864).

Meyerbeer had a most remarkable genius for adaptation, combined with a shrewd technical mastery and a keen business insight. All these fitted the period, and he was careful to see that they did. By writing what pleased he controlled the operatic situation of France absolutely. His librettist was Scribe, a man of sprawling talent, and the two knew to a beat how quickly the Parisian's pulse throbbed. The success of *Robert le Diable* was simply stupendous, and Meyerbeer held French opera in the palm of his hand. His hold on the public did not relax with his later works, and even the music-lover of to-day acknowledges the tremendous moments in *Les Huguenots* and *Le Prophète*; but his last work, *L'Africaine*, betrays the sameness of his methods, though there is a decided advance on the technical side of the orchestra. Meyerbeer was a master of sensational effect; his operas are not lacking in it, and they are full of bombast; to this end he employed a large and fully equipped orchestra. If to-day there is much in his works which is obsolete, there still remains enough to convince the just critic that here was a man of great talent who molded himself so accurately to fit the time that one is frequently misled into believing that he was a product of the early thirties in Paris. In contrast to this honor-crammed career is the one of Hector Berlioz (1803-69), that strange, willful genius who yielded not a jot to popular likes. His operas are fantastic creations that have never appealed to managers of opera houses: in fact, his huge double work, *Les Troyens*, had to wait until 1893 for its première. He also composed a sprightly musical comedy, *Beatrice et Benedict*. It is most unlikely that his operas ever will become repertory pieces; when they were written they were considered too much in advance of their time, and now Richard Wagner's music dramas have made most of the advanced works seem old-fashioned.

Jacques Fromenthal Halévy (1799-1862) bridges the gap between Meyerbeer and Charles François

Gounod (1818-93), whose *Faust* is probably the most popular of French operas. His later work, of equal pretensions, *Romeo et Juliette*, is marred by its sentimentality. A word about the French Opéra-Comique: It was naturally the child of Italian *opera buffa*, and in time gained importance as an art form. Its earlier composers —Philidor (1726-95), Monsigny (1729-1817), Grétry (1741-1813), wrote light, pleasing music. Méhul (1763-1817), who was a pupil of Gluck, introduced some ideas bordering on the serious, as did Boieldieu (1775-1834). Then came Auber and Hérold (1791-1833), who raised the standard considerably. It grew entirely serious when the unique operettas of Offenbach attracted the jocose element to the Opera-Bouffe. The Opéra-Comique had branched out before, but Offenbach drew the dividing line plainly. Since then some of the works written for the Opéra-Comique differ from those at the Grand Opéra only in that the dialogue in the former is spoken, not sung. Among its serious contributors were Gounod with *Mireille*, Ambroise Thomas with *Mignon*, and Bizet with the masterpiece of them all, *Carmen*. This work is a classic, and where it is performed with sung dialogue rears its head high above some of the more pretentious works of the Grand Opéra school. Among more recent contributors to the repertory of the Opéra-Comique are Delibes, Massé, De Joncières, Massenet, Godard, Saint-Saëns, Lalo, Bruneau, D'Indy, and Charpentier. Some of the latter have even done away with the old-time formula of spoken recitative, and now there is little theoretical difference between works produced at the Comique and the Opéra.

THE GERMANS AND WAGNER.

Mozart's early death left Germany without any great opera composers until Ludwig van Beethoven (1770-1827) wrote *Fidelio*. Beethoven was about the last man who might be expected to attack the task of opera-writing—all his works had been in the line of absolute music; but finally he selected a surprisingly bad libretto and went to work. *Fidelio* is one of the most curious compositions in the entire literature of opera; it is so full of contradictions. From passages that are nothing short of superb and wonderful it ranges to episodes when the listener feels that the composer is decidedly out of sympathy with his subject and the art form. As a whole—despite the overwhelming 'Abscheulicher' air and the superb duo in the second act—it is disappointing and even admitting all greatness possible it is at best scarcely an opera. The next important figure is Louis Spohr (1784-1859), whose operas marked the beginning of German Romanticism, followed closely by Weber (1786-1826), whose works show this movement in full bloom. His principal opera, *Der Freischütz*, is still in the repertoire and apt to remain so for a long time to come, since the music displays a buoyancy and richness of sentiment that are remarkable. He is by far the most German of all opera composers—Wagner not expected—and seems to have embodied in his music many of the national characteristics. In the wake of Weber came a string of opera composers who have been designated depreciatingly as the writers of 'kapellmeister' music. The list is too long and unimportant to repeat; but there were a few others who rose distinctly above this level and really produced some good work. First among these is Heinrich Marschner (1795-1861), some of whose operas are still produced to-day in Germany; the same is the case with Albert Lortzing (1803-51). Peter Cornelius (1824-74) left at least—thanks to the kindness of Liszt—one opera, the *Barbier von Bagdad*, which has survived its critics. Incidental mention may be made of musical works with spoken dialogue—*Singspiele* they were called—among which Otto Nicolai's (1810-49) *Die lustigen Weiber von Windsor* is a charming example. But the operatic list might be prolonged indefinitely, it includes the names of Schubert, Mendelssohn, Liszt, and Schumann, and at the end it would be found that none of them affected the history of opera to be sufficiently worthy of mention. Besides, interest of this period centres in the greatest figure of the whole history of opera, Richard Wagner (1813-83).

Wagner's musical development is one of the most remarkable on record. Passing over two youthful works—*Die Feen* and *Das Liebesverbot*—which are of historical interest only, his career as opera composer began with *Rienzi*, a work designed for the Paris Grand Opéra, and one which out-Meyerbeers Meyerbeer. Successful as this was, Wagner must have realized that the old form was a bar to any progress, and he turned his back on it for all times. With his next opera, *The Flying Dutchman*, he works along the lines laid down by Weber; but his own individuality was so marked that the result is not at all Weberish. After this he takes a tremendous leap forward and lands with *Tannhäuser*, again a tentative move; then with another effort he achieves *Lohengrin*. No other case in music history comes to mind where three moves cover so great an advancement as those from *Rienzi* to *Lohengrin*. Now followed the period of his political exile, which gave him liberal opportunities to ponder the problem of music-drama. During these broodings he saw that opera was going the wrong way. The set forms of aria, recitative, of chorus, and orchestral accompaniments and interludes, must be abolished. He thought and wrote out the problem, arriving at the idea that the one possible salvation of this art form lay in abandoning all the excrescences of the later Italian, the Neapolitan school, and going back to the original principles of the Florentine *Camerata*. Upon these he experimented until he had formulated his basis for a music-drama with its logical development of the leitmotiv (q.v.)—or leading motive—and its welding into a great synthesis, song, action, and orchestra. Not only did he theorize, but he composed his tetralogy, *Der Ring des Nibelungen*, of which *Das Rheingold* was the first part. One vital point must be made here; that in every case Wagner was his own librettist. This was the first active rebellion against the puerile stuff furnished by poets for musical setting. *Rheingold* was followed by the second part, *Die Walküre*, and that by *Siegfried*. Poverty and troubles of exile compelled an interruption, during which time *Tristan und Isolde* and *Die Meistersinger von Nürnberg* were composed in hopes of having them produced—a thing which did not seem at all likely to happen to the *Ring*. Eventually he secured the patronage of King Louis II. of Bavaria and finished *Siegfried*, together with the final part, *Götterdämmerung*. Then followed the planning and contriving to

have an opera house built in which he could produce this great tetralogy, and after a long fight Bayreuth was selected and the theatre constructed. He closed his life's work by writing *Parsifal*, soon after the first performance of which he died. No other composer ever schemed such sweeping reforms; none other ever held out so obstinately for dramatic verity. He came nearer than any one in merging the word and its meaning into the sound musical, and his technical mastery allowed him to do just that which he started out to do; though in the last analysis Wagner the musician triumphs over the theorist Wagner. It is perhaps not just to speak of Wagner's work as an operatic reform; he did more than this, since he demolished opera as he found it—a mere string of idle tunes strung on silly words—and constructed it anew, with a few shadowy precedents to guide him. His versatility is shown by the range of poetic subjects he handled—each one with an enviable amount of sincerity; his *Ring* more nearly approaches the magnitude of the Greek drama than anything in modern times. And in *Tristan* he has on the simplest action achieved a musical drama that stands as a granitic block. His influence was and is tremendous; probably no composer of opera since has been able to escape it; either he has imitated or he has rejected Wagner—in both cases the influence is traceable.

MODERN TENDENCIES.

Giuseppe Verdi (1813-1901) must be considered first of all. He began his career when Italy was still absorbing the melodic treacle that flowed from the pens of Donizetti and Bellini, and he closed it two decades after Richard Wagner had died. He was a most prolific writer and a progressive one. His early works were of the approved style of the period; then came a spell during which he wrote what still remain his most popular works—*Rigoletto*, *Il trovatore*, and *La traviata*—and then he matured into such a work as *Aïda*, a vast improvement on all its predecessors. By this time he had acquired a certain amount of dramatic freedom which was most valuable, added to the skill with which he wrote for the voice. After the revolutionary period in opera—the period when Wagner was alive and during much of which Verdi lived in silence—the aged Italian came forward anew with *Otello*, considered by some critics his greatest work and certainly among the great operas. From Wagner he had learned the importance of being musically sincere to one's text at all hazards; and either by chance or fate he was blessed with one of the best operatic texts written, compiled from Shakespeare by Boito. *Otello* is an astounding work in many ways. It is lyric—Verdi apotheosized the voice—and forcefully dramatic; as a whole it is satisfying, in parts tremendous. Still later in life he brought forth *Falstaff*, a work so viable with youthful vigor that every page of it denies the number of years then piled on Verdi's head. With this he concluded his career.

Very near Verdi—his friend, and librettist in the later works—stands Arrigo Boito (1842—). His one produced opera, *Mefistofele*, was at its time full of a promise which the composer has not yet made good, although he has promised *Nero*, which in 1903 was reported to be almost completed. A follower of Verdi was Amilcare Ponchielli (1834-86), whose fame lives in *La Gioconda*. Then follows a list of younger composers—the school of brutal verity—Puccini, a man of much talent and great technique; Franchetti, Spinelli, Giordano, and others—to say nothing of Mascagni and Leoncavallo, whose *Cavalleria rusticana* and *Pagliacci*, respectively, have made them known the world over. But they all seem to be groping. Not only Wagner, but also Verdi, with his last works, left them in a maze of theories with no settled sign post to direct them. Germany is still subject to the Wagner influences. The later men have done nothing startling—as Verdi did—but principally have followed Wagner, as Humperdinck, Richard Strauss, Bungert, D'Albert, Goldmark, Schillings, Siegfried Wagner, Weingartner, Kienzl, and others. Very recently Richard Strauss has composed a *Singgedicht Feuersnot*, which has met with success, but it is scarcely possible that the form is favorable to great development. His early music-drama, *Guntram*, reveals post-Wagnerian ideals. Practically the history of German opera closes with Wagner. The name of Johann Strauss (1825-99), a member of the celebrated family of dance composers, must not be omitted. His joyous, sparkling light operas are a distinct *genre*—*Die Fledermaus* is a masterpiece in little. It has found a large following—Von Suppé, Genée, and others.

The Wagner influence also pervaded France, where it brewed a tempest. The public decried it—so did some of the native composers; but others and wiser ones bowed their musical heads, accepted and for a time followed the master. Of late France has developed operatic realism and has produced a school of very clever musicians who have more technique than ideas. An exception is the Belgian—musically, France and Belgium are one—César Franck (1822-90), who was a spiritual thinker; but his opera *Hulda* is almost unknown. Reyer (1823—) has made tedious attempts to preserve the classic in opera, while Saint-Saëns (1835—) and Massenet (1842—) have floundered from the school of Meyerbeer to the more sensational style of the younger men. Of the latter, mention must be made of Charpentier, D'Indy, Hue, Pierné, Leroux, and Bruneau. Faure, and later and more important, Debussy, have written serious and intricate incidental music to accompany spoken drama. This is mere experimenting, since poetry and music must be united by closer bonds if they are to be joined at all. Altogether the operatic situation in France is not promising. Most of the modern works are threatened with an early decline, and on the horizon there is no figure promising enough to originate a new operatic faith. The Bohemian Smetana (1824-84) and his pupil Dvořák (1841-1904) have added works of local color to opera, but nothing absolutely revolutionary. The Polish pianist-composer Paderewski composed *Manru* (1901), and two other Poles, Xavier Scharwenka and Moritz, or Moszkowski, respectively, wrote *Mataswintha* and *Boabdil*. Russia has worked long and earnestly to produce a school of national opera composers. Let a few names suffice: Glinka (1804-57), Dargomyzhsky (1813-69), Séroff (1819-71), Rubinstein (1829-94), César Cui (1835—), Tschaikowsky (1840-93), Borodin (1834-87), and Rimsky-Korsakoff (1844—). Few of their works are heard outside of Russia.

England makes sporadic attempts to breed

native composers, and every now and again succeeds in producing some operatic novelty which dies immediately or soon after its appearance in a world of which Wagner is still lord. After the Handel invasion England contented itself with imitative Italian opera and English ballad opera. Arne (1710-78), Bishop (1786-1855), John Barnett (1802-90), Balfe (1808-70), Wallace, (1814-65), Benedict (1804-85), Macfarren (1813-87), Goring Thomas (1851-92), and Arthur Sullivan (1842-1902), bring the list to the prominent ones of the younger school: Stanford, Cowen, Mackenzie, MacCunn, De Lara, Bunning, and Ethel Smyth. Some of their works have been fostered by local pride and have gained notoriety—there is scarcely a masterpiece among them. The cleverest one of the modern English composers, Sullivan, gave the best of himself to comic opera, in which line he achieved international reputation. England is far behind Italy, Germany, and France in the quality of its native operas produced, and its future seems unpromising enough to discourage any musical optimist. In the United States the field of serious opera has been plowed, but the harvest time is not yet. Of so-called comic operas—with a few honorable exceptions—which in the United States have degenerated into musical farces—there is no end to their number and no limit to the poorness of their quality. It seems safe to assert that the world's history of opera closed for the present with the last work of Verdi. Since then operas have been either experiments or imitations of the good that has gone before.

BIBLIOGRAPHY. Clément and Larousse, *Dictionnaire lyrique, ou Histoire des opéras* (Paris, 1869-77); Reynard, *La renaissance du drame lyrique 1600-1876; essai de dramaturgie musicale* (Paris, 1895); Apthorp, *The Opera Past and Present* (New York, 1901); Hanslick, *Am Ende des Jahrhunderts* (Berlin, 1899); Bruneau, *Musiques d'hier et de demain* (Paris, 1900); Henderson, *The Story of Music* (New York, 1891); Elson, *A Critical History of Opera* (Boston, 1901); Newman, *Gluck and the Opera* (London, 1895); Soubies and Malherbe, *Histoire de l'Opéra-Comique* (Paris, 1892); Streatfield, *The Opera* (London, 1901); Upton, *The Standard Operas* (Chicago, 1891); Krehbiel, *Studies in the Wagner Drama* (New York, 1891). See MUSIC—SCHOOLS OF COMPOSITION; and the separate biographies of the composers mentioned. The following list comprises merely some of the more important grand and light operas. Frequently the same libretto served a number of composers, in which case only the more important names are mentioned:

OPERA LIST.

Opera.	Composer.	First Produced.
Abencérages, Les	Cherubini	1813
Abimelek	Meyerbeer	1813
Abreise, Die	D'Albert	1898
Abu Hassan	Weber	1811
Achille à Scyros	Cherubini	1804
Acide e Galatea	Haydn	1770
Acis and Galatea	Handel	1732
Actéon	Auber	1836
Adelaide di Borgogna	Rossini	1818
Adèle et Dorsan	Dalayrac	1795
Adelson e Salvina	Bellini	1824
Admeto	Handel	1727
Adonis	Keiser	1697
Adriano in Siria	Caldara	1731
	Pergolesi	1734
	G. Scarlatti	1752
	Sacchini	1770
	Cherubini	1782
Adrien	Méhul	1799
Africaine, L'	Meyerbeer	1865
Agnes von Hohenstaufen	Spontini	1829
Aïda	Verdi	1871
Alceste	Lully	1674
	Gluck	1766
Alchimist, Der	Spohr	1830
Alcidor	Spontini	1825
Alcina	Handel	1735
Alessandro	Handel	1726
Alessandro nell' Indie	Vinci	1729
	Leo	1741
	Gluck	1745
	Jommelli	1757
	Sacchini	1768
	Paisiello	1775
	Cherubini	1784
Alessandro Severo	Handel	1738
Alessandro Stradella	Flotow	1844
Alfonso und Estrella	Schubert	1854
Alfred	Arne	1740
Ali Baba	Cherubini	1833
Ali Pascha von Janina	Lortzing	1824
Alruna	Spohr	1808
Amadis de Gaule	Lully	1684
Amant jaloux, L'	Grétry	1778
Amazones, Les	Méhul	1811
Ambassadrice, L'	Auber	1836
Ame en peine, L'	Flotow	1846
Amico Fritz, L'	Mascagni	1891
Amphitryon	Grétry	1780
Anacréon	Cherubini	1803
Andromaque	Grétry	1780
Andromeda und Perseus	J. W. Franck	1679
Angélique et Médore	Am. Thomas	1843
Angelo	C. Cui	1876
Anna Bolenna	Donizetti	1831
Antigone	Mendelssohn	1841
	J. A. Hasse	1723
Apollo et Hyacinthus	Mozart	1767
Arabi nelle Gallie, Gli	Pacini	1827
Ariadne	Porpora	1733
Ariodant	Méhul	1799
Ariodante	Handel	1735
Armide	Gluck	1777
Armide et Renaud	Lully	1686
	Cherubini	1782
	Zingarelli	1786
	Rossini	1817
Armin	H. Hofmann	1777
Arminius	Scarlatti	1714
	Handel	1737
	Hasse	1730
	Leo	1740
Artaserse	Gluck	1741
	Scarlatti	1763
	Piccini	1772
Artaxerxes	Arne	1762
Artemisia	Cimarosa	1801
Artisan, L'	Halévy	1827
Ascanio	Saint-Saëns	1890
Ascanio in Alba	Mozart	1711
Aspasie	Grétry	1789
Astarte	Buononcini	1720
Astianasse	Leo	1725
	Buononcini	1727
	Jommelli	1741
Attila	Verdi	1846
Avaro, L'	J. Haydn	1802
Avviso ai maritati	Cimarosa	1780
	Isouard	1795
Azémia	Dalayrac	1787
Bagatelle	Offenbach	1874
Ballo in maschera, Un	Verdi	1859
Barbares, Les	Saint-Saëns	1901
Barbe-Bleue	Offenbach	1866
Barbier de Trouville, Le	Lecocq	1871
Barbier von Bagdad, Der	P. Cornelius	1858
Barcarolle, La	Auber	1845
Bärenhäuter, Der	S. Wagner	1899
Basilius	Keiser	1693
Bastien und Bastienne	Mozart	1768
Ba-ta-clan	Offenbach	1855
Bayadères, Les	Catel	1810
Bayard à Mézières	Boieldieu, Catel, Isouard and Cherubini	1814
Bayards, Les	Offenbach	1863
Beatrice di Tenda	Bellini	1833
Béatrice et Bénédict	Berlioz	1862
Bégaiements d'amour	Grisar	1864
Beggars' Opera, The	Pepusch	1728
Beiden Pädagogen, Die	Mendelssohn	1821
Beiden Schützen, Die	Lortzing	1837
Belisario	Donizetti	1836

Opera.	Composer.	First Produced.
Belle Arsène, La	Monsigny	1773
Belle Hélène, La	Offenbach	1864
Bellérophon	Lully	1679
Belshazzar	Handel	1745
Benvenuto Cellini	Berlioz	1838
	F. Lachner	1849
Berenice	Porpora	1710
	Handel	1737
	Piccinni	1764
	Zingarelli	1811
Bergère châtelaine, La	Auber	1820
Bergers, Les	Offenbach	1865
Berggeist, Der	Spohr	1835
Bergtagna, Den	Hallström	1874
Bettelstudent, Der	Millöcker	1881
Bianca	Balfe	1860
Billet de Marguerite, Le	Gevaert	1854
Blanche de Provence	Boieldieu	1821
Boccaccio	Suppé	1879
Bohême, La	Leoncavallo	1897
	Puccini	1896
Bohemian Girl, The	Balfe	1843
Boris Godunoff	Mussorgski	1872
Boule de neige, La	Offenbach	1871
Braniboři v Čechách	Smetana	1865
Brasseur de Preston, Le	Adam	1838
Bravo, Il	Mercadante	1839
Bride of Song, The	Benedict	1864
Bride of Venice, The	Benedict	1844
Briganti, I	Mercadante	1836
Buona figliuola, La	Piccini	1760
Cadmus et Hermione	Lully	1673
Caïd, Le	Am. Thomas	1849
Cagliostro	Adam	1841
Calife de Bagdad, Le	Boieldieu	1800
Camargo	Lecocq	1878
Camille	Dalayrac	1791
Camillus	Gluck	1754
Canterbury Pilgrims, The	C. V. Stanford	1884
Captive, La	F. David	1866
Capuleti ed i Montecchi, I	Bellini	1830
Caractacus	Arne	1806
Carillonneur de Bruges, Le	Grisar	1852
Carline	Am. Thomas	1849
Carmen	Bizet	1875
Cartouche	H. Hofmann	1869
Castor et Pollux	Rameau	1737
Catarina Cornaro	Donizetti	1844
	F. Lachner	1841
Catharine Howard	Litolff	1847
Catherine Grey	Balfe	1837
Catone in Utica	Vinci	1727
	Leo	1732
	Graun	1744
	Jommelli	1749
	Piccini	1770
	Paisiello	1788
Cavalleria rusticana	Mascagni	1890
Caverne, La	Méhul	1795
	Lesueur	1793
Cendrillon	Isouard	1810
	Massenet	1899
Cenerentola, La	Rossini	1817
Cent vierges, Les	Lecocq	1872
Cephalus et Procris	Grétry	1773
Cert a Kaca	Dvořák	1899
Chalet, Le	Adam	1834
Chaperons blancs, Les	Auber	1836
Charles VI	Halévy	1843
Chatte merveilleuse, La	Grisar	1862
Chevalier d'Harmental, Le	Messager	1896
Chevalier Nahel, Le	Litolff	1863
Chilperic	Offenbach	1868
Cid, Le	Piccini	1763
	P. Cornelius	1860
	Massenet	1885
Cinq-Mars	Gounod	1877
Circassienne, La	Auber	1861
Circe	Cimarosa	1779
	Keiser	1734
Ciro in Babilonia	Rossini	1812
	Raimondi	1820
Clari	Halévy	1828
Clemenza di Tito, La	Gluck	1751
	Mozart	1791
Cleopatra e Cesare	K. H. Graun	1742
Cloches de Corneville, Les	R. Planquette	1877
Colomba	A. C. Mackenzie	1883
Colombe, La	Gounod	1866
Comédie à la ville, La	Gevaert	1848
Comte Carmagnola, Le	Am. Thomas	1841
Comte d'Ory, Le	Rossini	1828

Opera.	Composer.	First Produced.
Contessa de' Numi, La	Vinci	1729
	Paisiello	1773
	Caldara	1723
Contes d'Hoffmann, Les	Offenbach	1881
Cora	Méhul	1791
Coriolano	Cavalli	1669
	Caldara	1717
	Ariosti	1723
Corona, La	Gluck	1765
Così fan tutte	Mozart	1790
Cour de Célimène, La	Am. Thomas	1855
Cour du roi Pétaud, La	Delibes	1869
Cox and Box	Sullivan	1867
Creole, La	Offenbach	1875
Crispino e la comare	L. and F. Ricci	1850
Crusaders, The	J. Benedict	1846
Czar und Zimmermann	Lortzing	1837
Dafne (first real opera)	Peri	1597
Dalibor	Smetana	1868
Dame blanche, La	Boieldieu	1825
Dame invisible, La	Berton	1787
Dame Kobold	J. Raff	1870
Damnation de Faust, La	Berlioz	1846
Dämon, Der	Rubinstein	1875
Danilowa	Adam	1830
Danza, La	Gluck	1755
Dardanus	Rameau	1739
	Sacchini	1784
Déjanire	Saint-Saëns	1898
Demetri	Caldara	1731
	Gluck	1742
	Joncières	1876
	Dvořák	1882
Demetrio e Polibio	Rossini	1812
Demofoonte	Caldara	1733
	Leo	1741
	Gluck	1742
	Hasse	1748
Démophon	Cherubini	1788
Déserteur, Le	Monsigny	1769
Deux avares, Les	Gretry	1770
Deux aveugles, Les	Offenbach	1855
Deux familles, Les	Labarre	1831
Deux reines de France, Les	Gaumod	1872
Deux nuits, Les	Boieldieu	1829
Devils' Opera, The	G. A. Macfarren	1838
Dieu et la Bayadère, Le	Auber	1830
Diana	Keiser	1712
Didon	Piccini	1783
Dido and Æneas	Purcell	1675
Didone abbandonata	Scarlatti	1724
	Piccini	1767
	Mercadante	1823
Dimitri	Joncières	1876
Dimitri Donskoi	A. Rubinstein	1852
Dimitrije	Dvořák	1882
Diva, La	Offenbach	1869
Djamileh	Bizet	1872
Djelma	Lefebvre	1894
Docteur Miracle, Le	Lecocq and Bizet	1857
Domino noir, Le	Auber	1837
Don Bucefalo	A. Cagnoni	1847
Don Carlos	Verdi	1867
Don César de Bazan	Massenet	1872
Don Giovanni (Don Juan)	Mozart	1787
	Gluck	1761
Donna Diana	H. Hofmann	1886
Don Pasquale	Donizetti	1843
Don Quixote	Purcell	1694
	Schack	1792
	Macfarren	1846
	Moniuszko	1847
Don Sébastien	Donizetti	1843
Dot, La	Dalayrac	1785
Double échelle, Le	Am. Thomas	1837
Dragon of Wantley, The	J. F. Lampe	1737
Drapier, Le	Halevy	1849
Drei Pintos, Die	Weber	1888
Due Foscari, I	Verdi	1845
Duenna	Linley	1776
Echo et Narcisse	Gluck	1779
Eden, L'	F. David	1848
Edoardo e Cristina	Rossini	1819
Edgar	Puccini	1889
Egyptienne, L'	Lecocq	1890
Elisa	Cherubini	1794
Elisabeth	Donizetti	1853
Elisa e Claudio	Mercadante	1821
Elisir d'amore, L'	Donizetti	1832
Enfant prodigue, L'	Auber	1850
Entführung aus dem Serail, Die	Mozart	1782

Opera.	Composer.	First Produced.
Ernani	Verdi	1844
Ernelinde, Princess de Norvège	Philidor	1767
Eroe Cinese, L'	Gluck	1754
Ero e Leandro	Mancinelli	1897
Erostrate	Reyer	1862
Esclarmonde	Massenet	1889
Esclave du Camoëns, L'	Flotow	1843
Esmeralda	Dargomyzhsky A. G. Thomas	1847 1883
Etienne Marcel	Saint-Saëns	1879
Etoile du nord, L'	Meyerbeer	1854
Eugen Onegin	Tschaikowsky	1892
Euryanthe	Weber	1823
Euridice	Peri and Caccini	1600
Evangelimann, Der	Kienzl	1895
Ezio	Handel J. C. Bach Mercadante	1732 c.1770 1826
Fair Rosamond	Barnett	1837
Fairy Queen, The	Purcell	1692
Fabegname di Livonia, Il	Donizetti	1819
Falkners Braut, Des	Marschner	1832
Falstaff	Balfe Verdi	1838 1893
Faniska	Cherubini	1806
Faramondo	Handel	1738
Fatinitza	Suppé	1876
Faust	Gounod Spohr	1859 1818
Favorita, La	Donizetti	1840
Feen, Die	Wagner	1888
Feldlager in Schlesien, Das	Meyerbeer	1844
Feldprediger, Der	Millöcker	1884
Félix	Monsigny	1777
Feramors	Rubinstein	1863
Fernand Cortez	Spontini	1809
Fervaal	Vincent d'Indy	1897
Fête du village voisin, La	Boieldieu	1816
Fêtes de l'Amour et de Bacchus, Les	Lully	1672
Fiancée, La	Auber	1829
Fiancée du diable, La	Massé	1855
Fidelio	Beethoven	1805
Fierabras	Schubert	1861
Fifi et Nini	Hervé	1856
Figaro, Le nozze di	Mozart	1786
Fille de Madame Angot, La	Lecocq	1872
Fille du régiment, La	Donizetti	1840
Fils du brigadier, Les	Massé	1867
Finta giardiniera, La	Mozart	1775
Flavio	Handel	1723
Fledermaus, Die	J. Strauss	1874
Fleur de thé	Lecocq	1868
Flibustier, Le	C. Cui	1894
Fliegende Holländer, Der	Wagner	1843
Forestier, Le	Flotow	1840
Forza del destrino, La	Verdi	1862
Fra Diavolo	Auber	1830
Francesca da Rimini	Goetz	1877
Françoise de Rimini	Am. Thomas	1882
Freischütz, Der	Weber	1821
Fürst und Sänger	F. Mottl	1893
Gabrielle d'Estrées	Méhul	1806
Galatée	Massé	1852
Gasparone	Millöcker	1884
Genoveva	Schumann	1850
Ghiselle	César Franck	1896
Gianne di Calais	Donizetti	1828
Gille et Gillotin	Am. Thomas	1874
Gilles ravisseur	Grisar	1848
Gioconda, La	Ponchielli	1876
Giovanna d'Arco	Verdi	1845
Gioventù di Enrico Quinto, La	Hérold	1815
Giralda	Adam	1850
Giroflé-Girofla	Lecocq	1874
Giulio Cesare	Handel	1724
Giulio Sabino	Sarti	1781
Giustino	Handel	1737
Goldene Kreuz, Das	J. Brüll	1875
Golden Web, The	A. G. Thomas	1893
Gorjushka	Rubinstein	1889
Götterdämmerung, Die	Wagner	1876
Göttin der Vernunft, Die	J. Strauss	1897
Grande-Duchesse de Gérolstein, La	Offenbach	1867
Grand Casimir, Le	Lecocq	1879
Grand' tante, La	Massenet	1867
Griselda	Buononcini	1722
Griséldis	Massenet	1901

Opera.	Composer.	First Produced.
Grossadmiral, Zum	Lortzing	1847
Guarany, Il	C. Gomez	1870
Gudrun	Draeseke Reissmann Klughardt	1884 1871 1882
Guido et Genevra	Halévy	1838
Guillaume Tell	Rossini	1829
Guntram	Richard Strauss	1894
Gustave III	Auber	1833
Halka	Moniuszko	c.1856
Hamlet	Am. Thomas	1868
Hänsel und Gretel	Humperdinck	1893
Hans Heiling	Marschner	1833
Hans Sachs	Lortzing	1840
Harald der Wiking	Hallén	1881
Häusliche Krieg, Der	Schubert	1861
Heimchen am Herd, Das	Goldmark	1896
Heimkehr aus der Fremde, Die	Mendelssohn	1829
Henri IV., Le jeune	Méhul	1797
Heinrich VIII	Saint-Saëns	1883
Héloïse et Abélard	Litolff	c.1866
Herculaneum	F. C. David	1859
Hérodiade	Massenet	1884
Hésione	Campra	1700
Herzog Wildfang	S. Wagner	1901
Hexfallen	Hallén	1896
Hippolyte et Aricie	Rameau	1733
Hochzeit des Camacho, Die	Mendelssohn	1827
Hubička	Smetana	1876
Huguenots, Les	Meyerbeer	1836
Hulda	César Franck	1894
Idomeneo, rè di Creta	Mozart	1781
Ifigenia in Aulide	Cherubini	1788
Imeneo	Handel	1740
Incoronazione di Poppea, L'	Monteverde	1642
Ingeborg	Geisler	1884
Ipermestra	Feo	1825
Iphigénie en Aulide	Gluck	1774
Iphigénie en Tauride	Gluck Piccini	1779 1781
Iris	Mascagni	1898
Isis	Lully	1677
Isola disabitata, L'	Haydn	1779
Isoline	Messager	1899
Ivanhoe	Sullivan	1891
Jacquerie, La	Lalo	1895
Jean de Paris	Boieldieu	1812
Jean qui pleure et Jean qui rit	Offenbach	1865
Jenny Bell	Auber	1855
Jessonda	Spohr	1823
Jeune femme colère, La	Boieldieu	1805
Joaillier de Saint-James, Le	Grisar	1862
Jolanthe	Tschaikowsky	1893
Jolie fille de Perth, La	Bizet	1867
Jolie Persane, La	Lecocq	1879
Joseph	Méhul	1807
Juive, La	Halévy	1835
Judith	Seroff	1863
Kalashnikoff moskovski Kupets	Rubinstein	1880
Karneval in Rom, Der	J. Strauss	1878
Kenilworth	B. O. Klein	1895
Kinder der Heide, Die	Rubinstein	1861
King Arthur	Purcell	1791
Knyaz Igor	Borodin	1891
König Manfred	K. Reinecke	1867
Königin von Saba, Die	Goldmark	1875
Lakmé	Delibes	1883
Lalla Roukh	F. David	1862
Lapin blanc, Le	Hérold	1826
Lestocq	Auber	1834
Liebeskampf, Der	Meyer-Helmund	1892
Liebesverbot, Das	Wagner	1836
Lily of Killarney, The	Benedict	1862
Linda di Chamounix	Donizetti	1842
Lodoïska	Cherubini Kreutzer	1791 1791
Lohengrin	Wagner	1850
Lombardi alla prima crociata, I	Verdi	1843
Lord of the Manor	W. Jackson	1780
Lorelei	Lachner	1846
Lotario	Handel	1729
Louise	Charpentier	1900

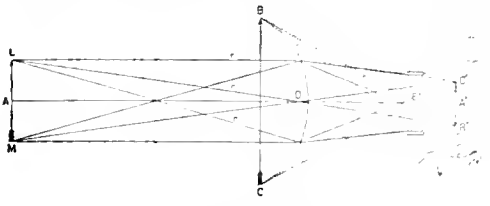
Opera.	Composer.	First Produced.
Lucia di Lammermoor	Donizetti	1835
Lucio Silla	Mozart	1772
Lucrezia Borgia	Donizetti	1834
Ludovic	Hérold and Halévy	1833
Luisa Miller	Verdi	1849
Lustige Krieg, Der	J. Strauss	1881
Lustigen Weiber von Windsor, Die	Nicolai	1849
Macbeth	Verdi	1847
Madame Favart	Offenbach	1879
Maestro di musica, Il	Pergolesi	1731
Mage, Le	Massenet	1891
Magicienne, La	Halévy	1858
Maid Marian	Bishop / De Koven	1822 / 1901
Maid of Artois, The	Balfe	1836
Maid of the Mill	S. Arnold	1765
Maison à vendre	Dalayrac	1809
Maître de chapelle, Le	Paër	1821
Makkabäer, Die	Rubinstein	1875
Manon	Massenet	1884
Manon Lescaut	Auber	1856
Manru	Paderewski	1901
Maometto secondo	Rossini	1820
Maréchal ferrant, Le	Philidor	1761
Margherita d'Anjou	Meyerbeer	1820
Mariage impossible, Le	Grisar	1833
Maria Stuarda	Mercadante / Donizetti	1821 / 1834
Marie	Hérold	1826
Marino Faliero	Donizetti	1835
Maritana	W. V. Wallace	1845
Marjolaine, La	Lecocq	1877
Martha	Flotow	1847
Masaniello	Auber	1828
Martyrs, Les	Donizetti	1840
Mascotte, La	Audran	1880
Masnadieri, I	Verdi	1847
Matilda di Ciabrano	Rossini	1821
Matrimonio segreto, Il	Cimarosa	1792
Mazeppa	Tschaikowsky	1882
Medea in Corinto	S. Mayr	1813
Médecin malgre lui, Le	Gounod	1858
Médée	Cherubini	1797
Medici, I	Leoncavallo	1893
Meïstofele	Boito	1868
Meistersinger von Nürnberg, Die	Wagner	1868
Merlin	Goldmark	1886
Merope	Jommelli	1742
Messaline	De Lara	1899
Methusalem, Prinz	J. Strauss	1877
Mignon	Am. Thomas	1866
Mikado, The	Sullivan	1885
Mireille	Gounod	1864
Mitridate rè di Ponto	Mozart	1770
Mlada	Rimsky-Korsakoff	1892
Molenara, La	Paisiello	1788
Monsieur Lohengrin	Audran	1896
Moïsè in Egitto	Rossini	1818
Moses	Rubinstein	1887
Mountain Sylph, The	J. Barnett	1834
Mousquetaires de la reine, Les	Halévy	1846
Musikanten, Die	Flotow	1887
Muzio Scevola	Handel, Ariosti, and Buononcini	1721
Nacht in Venedig, Eine	J. Strauss	1883
Nachtlager in Granda, Das	K. Kreutzer	1834
Nadeshda	A. G. Thomas	1885
Naïda	Flotow	1873
Naïs	Rameau	1749
Navarraise, La	Massenet	1894
Nero	Handel / A. Rubinstein	1705 / 1879
Niccolò de' Lapi	Pacini	1873
Nitteti	Sarti / Paisiello / Jommelli	1765 / 1781 / 1753
Noces de Jeannette, Les	Massé	1853
Noces d'Olivette, Les	Audran	1879
Nonne sanglante, La	Gounod	1854
Nordlicht, Das	Millöcker	1897
Norma	Bellini	1831
Nouveau seigneur du village, Le	Boieldieu	1813
Nozze di Enea con Lavinia, Le	Monteverde / A. Scarlatti / Vinci	1641 / 1720 / 1724
Nuit de Cléopâtre, Une	Massé	1885
Nurmahal	Spontini	1822
Nyaga	Hallström	1885
Oberon	Weber	1826
Oberto conte di San Bonifacio	Verdi	1839
Oca del Cairo, L'	Mozart	1783
Oedipe à Colone	Sacchini	1787
Olimpiade, L'	Cimarosa / Leo / Pergolesi / Piccini / Sacchini	1784 / 1737 / 1735 / 1761 / 1767
Orlando	Handel	1733
Orfeo	Monteverde	1607
Orfeo ed Euridice	Gluck	1762
Orphée aux enfers	Offenbach	1858
Otello	Rossini / Verdi	1816 / 1887
Pagliacci, I	Leoncavallo	1892
Paladins, Les	Rameau	1760
Panier fleuri, Le	Am. Thomas	1839
Panurgi dans l'île des lanternes	Grétry	1785
Pardon de Ploërmel, Le	Meyerbeer	1859
Parisina	Donizetti	1833
Parsifal	Wagner	1882
Part du diable, La	Auber	1843
Pastor fido, Il	Handel	1712
Patience	Sullivan	1881
Paul und Virginie	R. Kreutzer / Lesueur / Massé	1791 / 1794 / 1876
Pêcheurs de perles, Les	Bizet	1863
Pêcheurs, Les	Gossec	1766
Pélage	Spontini	1814
Perle du Brésil, La	F. David	1851
Perruquier de la régence, Le	Am. Thomas	1838
Persée	Lully	1682
Peter Schmoll und seine Nachbarn	Weber	1803
Petit chaperon rouge, Le	Boieldieu	1818
Petit duc, Le	Lecocq	1878
Phaëton	Lully	1683
Philémon et Baucis	Gounod	1860
Philtre, Le	Auber	1831
Phrosine et Mélidore	Méhul	1794
Phryné	Saint-Saëns	1893
Pietro von Albano	Spohr	1827
Pinafore, H.M.S.	Sullivan	1878
Pique, Dame	Suppé	1894
Pirata, Il	Bellini	1827
Pirates of Penzance, The	Sullivan	1879
Poliuto	Donizetti	1848
Polyeucte	Gounod	1878
Pomo d'oro, Il	Cesti	1666
Pomone	Cambert	1671
Poro	Handel	1731
Postillon de Lonjumeau, Le	A. Adam	1836
Pré aux clercs, Le	Hérold	1832
Preciosa	Weber	1821
Premier jour de bonheur, Le	Auber	1868
Princesse jaune, La	Saint-Saëns	1872
Prophète, Le	Meyerbeer	1849
Proserpine	Lully / Saint-Saëns / Paisiello / Lully	1680 / 1887 / 1803 / 1678
Psyché	Am. Thomas	1857
P'tites Michu, Les	Messager	1897
Puritani, I	Bellini	1835
Puritan's Daughter, The	Balfe	1861
Quentin Durward	Gevaert	1858
Quinto Fabio	Cherubini	1780
Radamisto	Handel	1720
Rapimento di Cefalo, Il	Caccini	1597
Rappresentazione dell' anima e del corpo, La	Cavalieri	1600
Ratcliff, Guglielmo	Mascagni	1895
Reine de Chypre, La	Halévy	1841
Reine de Saba, La	Gounod	1862
Renaud	Sacchini	1783
Renaud d'Ast	Dalayrac	1787
Rè pastore, Il	Mozart / Sarti	1775 / 1753
Rêve d'amour	Auber	1869
Rheingold, Das	Wagner	1869
Riccardo	Handel	1727
Rienzi der Letzte der Tribünen	Wagner	1842
Richard Cœur de Lion	Grétry	1784
Rigoletto	Verdi	1851
Rinaldo	Handel	1711

Opera.	Composer.	First Produced.
Ring des Nibelungen, Der: the tetralogy comprising Das Rheingold, Die Walküre, Siegfried, and Götterdämmerung (qq.v.)	Wagner	1876
Rita	Donizetti	1860
Ritorno d'Ulisse, Il	Monteverde	1641
Rob Roy	Flotow	1837
Robert Bruce	Rossini	1846
Robert le Diable	Meyerbeer	1831
Robin Hood	Macfarren / De Koven	1860 / 1890
Rodrigo	Handel	1707
Roi de Lahore, Le	Massenet	1877
Roi d'Ys, Le	Lalo	1888
Roi d'Yvetot, Le	Adam	1842
Roi l'a dit, Le	Delibes	1873
Roland	Lully / Piccini	1685 / 1778
Roméo et Juliette	Bellini / Gounod	1859 / 1867
Rosamunde	Schubert	1823
Rosaura, La	Scarlatti	1690
Rose of Sharon, The	Mackenzie	1884
Rosières, Les	Hérold	1817
Rübezahl	Flotow	1854
Rubin, Der	Eugène d'Albert	1893
Ruggiero, Il	J. A. Hasse	1771
Runenstein, Am	Flotow	1868
Ruslan e Ludmilla	Glinka	1842
Russalka	Dargomyzhsky	1867
Ruy Blas	Marchetti	1869
Sadko	Rimsky-Korsakoff	1876
Saffo	Pacini	1840
Salammbô	Reyer	1890
Samson et Dalila	Saint-Saëns	1877
Sappho	Gounod / Massenet	1851 / 1897
Sarah	Grisar	1836
Sarazin	C. Cui	1899
Sardanapale	Joncières	1867
Savonarola	C. V. Stanford	1884
Schauspieldirektor, Der	Mozart	1796
Scipione	Handel	1726
Selma Sedlák	Dvořák	1878
Semiramide	Rossini	1823
Sémiramis	Catel	1802
Serment, Le	Auber	1832
Serse	Cavalli / Handel	1654 / 1738
Sesostrate	J. A. Hasse	1726
Shamus O'Brien	C. V. Stanford	1896
Sherif, Le	Halévy	1839
Siège de Corinthe, Le	Rossini	1826
Siegfried	Wagner	1876
Sigesmondo	Rossini	1815
Simone Boccanegra	Verdi	1856
Sirène, La	Auber	1844
Snegorotchka	Rimsky-Korsakoff	1882
Sogno di Scipione, Il	Mozart	1772
Sonnambula, La	Bellini	1831
Songe d'une nuit d'été, Le	Am. Thomas	1850
Sorcier, Le	Philidor	1764
Sosarme	Handel	1732
Spiegelritter, Der	Schubert	1815
Spitzentuch der Königin, Das	J. Strauss	1880
Sposo deluso, Lo	Mozart	1784
Stradella, Alessandro	Flotow	1837
Sylvana	Weber	1810
Tancredi	Rossini	1813
Tannhäuser	Wagner	1845
Tarare	Salieri	1787
Tcharodjeika	Tschaikowsky	1887
Telemacco	Gluck / Scarlatti	1750 / 1718
Télémaque dans l'île de Calypso	Lesueur	1796
Temistocle	Caldara / J. C. Bach	1736 / 1760
Tempête, La	Am. Thomas	1889
Templer und die Jüdin, Die	Marschner	1829
Templiers, Les	Litolff	1886
Thaïs	Massenet	1894
Theodora	Handel	1749
Thésée	Lully	1675
Timbre d'argent, Le	Saint-Saëns	1877
Tolemeo	Handel	1728
Torquato Tasso	Donizetti	1833
Torvaldo e Dorliska	Rossini	1815
Tosca	Puccini	1900

Opera.	Composer.	First Produced.
Todte Gast, Der	Millöcker	1865
Traviata, La	Verdi	1853
Trial by Jury	Sullivan	1875
Tribut de Zamora, Le	Gounod	1881
Troyens, Les	Berlioz	1897
Tristan und Isolde	Wagner	1865
Trompeter von Sackingen, Der	Nessler	1884
Troubadour, The	Mackenzie	1886
Trovatore, Il	Verdi	1853
Troyens à Carthage, Les	Berlioz	1863
Tcharodeika	Tschaikowsky	1887
Tcheravitchki	Tschaikowsky	1885
Undine	Hoffmann / Lvoff / Lortzing	1816 / 1846 / 1845
Unter Räubern	Rubinstein	1883
Uthal	Méhul	1806
Vakula	Tschaikowsky	1876
Vampyr, Der	Marschner	1828
Vendôme en Espagne	Hérold and Auber	1823
Véronique	Messager	1898
Vert-vert	Offenbach	1869
Vestale, La	Spontini	1807
Veuve Grapin, La	Flotow	1859
Vie parisienne, La	Offenbach	1866
Villi, Le	Puccini	1884
Vivandière, La	Godard	1895
Vizeadmiral, Der	Millöcker	1886
Volière, La	Lecocq	1888
Voyevoda	Tschaikowsky	1869
Waldmeister	J. Strauss	1895
Waldmädchen, Das	Weber	1800
Walküre, Die	Wagner	1870
Wanda	Dvořák	1876
Werther	Massenet	1892
Wildschütz, Der	Lortzing	1842
William Ratcliff	C. Cui	1869
Zaïde	Mozart	c.1780
Zähmung der Widerspenstigen, Die	Goetz	1874
Zaïre	Lefebvre / Bellini / Mercadante	1887 / 1829 / 1831
Zampa	Hérold	1831
Zanetta	Auber	1840
Zanetto	Mascagni	1896
Zhizn za cezaria	Glinka	1836
Zauberflöte, Die	Mozart	1791
Zauberharfe, Die	Schubert	1820
Zaza	Leoncavallo	1900
Zelmira	Rossini	1821
Zémire et Azor	Grétry	1771
Zenobia	Piccini / J. A. Hasse	1756 / 1763
Zerline	Auber	1851
Zoraïme et Zulnar	Boieldieu	1798
Zoroastre	Rameau	1749
Zwillingsbrüder, Die	Schubert	1820

OPERA GLASS. A small double telescope, used for looking at objects that require to be seen clearly and distinctly rather than greatly magnified. The opera glass is short and light, and though it has usually small magnifying power (varying in most instances from two to three times), the large amount of light admitted by the object glass on account of its large angle of aperture enables it to present a well-illuminated picture which can be seen without undue strain to the eye. The opera glass allows the use of both eyes, which gives to the spectator the advantage of seeing objects stand out stereoscopically as in ordinary vision. It consists of two lenses, or sets of lenses, as each lens is generally achromatic and made up of two lenses of different glass fitted together. The object lens, which is the larger, is convex, and the eye lens is concave. They are mounted so that when the tubes are drawn out the distance between the two lenses shall be nearly equal to the difference of their focal lengths. The figure shows the

action of the opera glass. O is the object lens and E is the eye lens, the line AA′ representing the axis of the instrument. The object lens alone would form a real and inverted image C B′ of the distant object LM at or near its principal focus, were it not for the concave eye lens which changes the direction of the rays and causes them to diverge instead of converge at the focus.



OPERA GLASS.

Accordingly, the rays appear to diverge from an erect and magnified image located at BC. The formation of the image may be understood by tracing the course of rays, *r*, *r*, *r*, diverging from some point of the original object such as L. These rays diverge until they meet the convex lens O, which makes them convergent, and would bring them to a focus at B′, but the concave lens E causes them to diverge and take the direction of the rays *r′*, *r″*, *r‴*, entering the eye as if they came from the point B.

OP'ERET'TA (It., little opera). An opera of a light character, generally comic or humorous. Between the various numbers spoken dialogue is introduced. Although originally operettas were written in one act, they now contain generally two. As a rule these productions are ephemeral. But the operettas of Johann Strauss, Offenbach, and Sir Arthur Sullivan have survived their composers. See OPERA.

OPHELIA, ō-fē'lyā. In Shakespeare's *Hamlet*, the daughter of Polonius, in love with Hamlet, who puts her aside, and by mistake kills her father. Her mind gives way, and she becomes a pathetic figure in her madness. Her wandering fancies, her gayety and tears, and her old songs form a touching picture, true to nature. She meets an accidental death by drowning while gathering flowers.

OPH'ICLEIDE (from Gk. ὄφις, *ophis*, serpent + κλείς, *kleis*, key). A musical wind instrument of brass or copper, which ceased to be used in the orchestra about the middle of the nineteenth century. It consisted of a conical tube, terminating in a bell like that of a horn, with a mouthpiece similar to that of the serpent (q.v.), and with ten holes which were stopped by keys. The only ophicleide which was in general use was the bass, and that has now been superseded by the bass tuba in E flat. The compass of the ophicleide was about three octaves. The models varied in length from four to two feet.

OPHID'IA (Neo-Lat. nom. pl., from Gk. ὀφίδιον, *ophidion*, diminutive of ὄφις, *ophis*, serpent). An order of reptiles of the subclass Sauria, the serpents, which are distinguished from lizards by the fact that the right and left halves of the lower jaws are connected by an elastic band. See SNAKE.

O'PHIOCEPH'ALUS. See SNAKE-HEADED FISH.

OPHILETA. A genus of fossil gastropods very characteristic of the lower Ordovician strata of North America. The shells are from one-half to two inches in diameter, with impressed spires and flat or slightly concave lower surfaces. The upper surfaces of the whorls are sharply keeled, the keel of the outermost whorl being higher than those of the inner whorl. The shells resemble those of the genus Euomphalus, to which they are allied. About 15 species range from Potsdam to Trenton limestones, and of these *Ophileta complanata*, of the New York and Canadian Beekmantown limestones, is the best known.

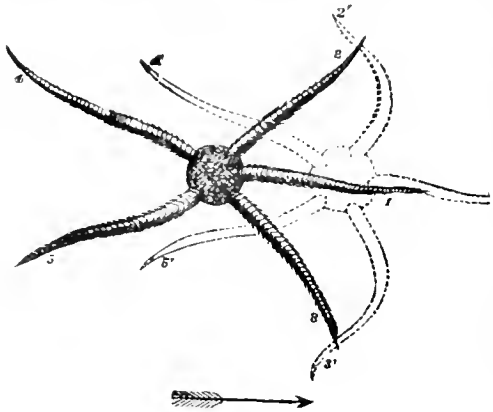
O PHIOL'ATRY. The worship of serpents. See NATURE-WORSHIP.

OPHIR, ō'fėr (Heb. *Ophīr*, Ophir). The region to which the ships of Hiram and Solomon went from Eziongeber, and whence they brought gold, precious stones, etc. (I. Kings ix. 26-28; x. 11; II. Chron. viii. 18; ix. 10). The region was chiefly remarkable for its gold. (Cf. Isa. xiii. 12; Job xxii. 24, et al.) The location of Ophir is a much vexed question. In Genesis x. 29 Ophir is mentioned in a list of the sons of Joktan. The names in this list are those of countries, and the Joktanites belong to Southern Arabia. The inclusion of Ophir shows, at least, where tradition placed the country, and there is much that speaks in favor of this traditional view, since Southern Arabia was known to the ancients as a gold-producing country. Hence, Glaser places Ophir on the east coast of Arabia, on the Persian Gulf. Other locations, however, have advocates, notably Zimbabwe, in Mashonaland (q.v.), South Africa. The Ethiopian coast of the Red Sea, Ceylon, and the Malay Peninsula have also been proposed. Consult the article "Ophir" by Price in the Hastings *Bible Dictionary*, vol. iii. (New York, 1900), and by Cheyne in *Encyclopædia Biblica*, vol. iii. (London, 1902).

OPHITES, ō'fits (Lat. *Ophites*, from Gk. Ὀφῖται, Ophite, from ὀφίτης, relating to a serpent, from ὄφις, *ophis*, serpent). A Gnostic sect. With the other Gnostics they shared the general belief of dualism, the conflict of matter and spirit, the emanations, the demiurgos, and other notions common to the many subdivisions of this school, but were distinguished from the rest by their peculiar doctrine and worship connected with their *ophis*, or serpent. Hence they were also called Naassenes (from Heb. *nāḥāsh*, serpent). Like most Gnostics, they regarded the demiurgos, or the Jehovah of the Old Testament, with great abhorrence, and, considering the emancipation of man from the power and control of the demiurgos as a most important end, they considered the serpent who tempted Eve, and introduced into the world 'knowledge' and revolt against Jehovah, to have been the great benefactor of the human race. Hence their worship of the serpent. Information regarding them is very meagre, and comes chiefly from antagonistic sources. They were in existence as late as the sixth century. Consult the monographs relating to them by Gruber (Würzburg, 1864) and Hönig (Berlin, 1889). See GNOSTICS.

O PHIUROI'DEA (Neo-Lat. nom. pl., from Gk. ὄφις, *ophis*, serpent + οὐρά, *oura*, tail). The class of brittle stars, or sand stars, of which Ophiura is the typical genus. Ophiuroids (or ophiurans) are star-shaped, freely moving echino-

derms (q.v.), with a flat, roundish or polygonal disk, from which suddenly arise five arms, which are slender, cylindrical, and contain no spacious continuation of the cœlomic cavity of the disk, or hepatic cæca, while there is no vent. There are no ambulacral grooves in the arms, and the



AN OPHIURAN.

Natural movements of a brittle star when proceeding along a solid horizontal surface. The arms are numbered.

suckers are but little used in locomotion, which is mainly effected by the arms themselves, the 'feet,' or ambulacra, being thrust out laterally and acting as tactile organs. The mouth and also the madreporite are on the under side of the disk. On the ventral surface, also, are five slits which connect with a corresponding number of respiratory sacs (bursæ) into which the ovaries or spermaries open. The eggs passing out through these slits are fertilized in the water,

STRUCTURE OF THE OPHIURAN ARM.

1. Diagrammatic cross-section of an arm; *a*, a dorsal plate; *b*, side plate; *c*, ventral plate; *d, d*, tube-feet, connected and penetrated by the ambulacral vessel; *e*, vertebral ossicle. 2. A vertebral ossicle, seen from the inward side, and surrounded by the external arm-plates. 3. Vertebral ossicles, viewed from the side.

the sexes being distinct. The ophiuroids, as a rule, pass through a well-marked metamorphosis, the free-swimming young being called a pluteus. Certain forms undergo self-division, and in others development is direct. The class is divided into two orders, *Ophiurida* and *Euryalida*, the latter having the arms greatly subdivided into long curly tendrils, as in Astrophyton, the basket-fish. Fossil ophiuroids begin to appear in the Silurian period, while genuine modern forms arose in the middle Trias. See BRITTLE STARS.

Both orders of the Ophiuroidea—the Ophiurida having simple arms and the Euryalida with branched arms—are represented from the Silurian onward, and the fossil forms show few important differences from their modern descendants. They are usually rare, but a few localities in the Devonian and in the Triassic and Jurassic shales and limestones have furnished well-preserved specimens in abundance. Such localities are Bundenbach (Devonian) and Solenhofen (Jurassic) in Germany, and Crawfordsville (Carboniferous) in Indiana. The more important genera are: Silurian—Eucladia, Protaster, Tæniaster; Devonian—Protaster, Ophiura; Carboniferous—Onychaster; Mesozoic—Aspidura, Geocoma, and Ophioglypha, with other modern genera. See ECHINODERMATA; BRITTLE STARS.

OPHTHAL'MIA (Lat., from Gk. *ὀφθαλμία*, disease of the eyes, from *ὀφθαλμός*, *ophthalmos*, eye; connected with *ὄπωπα*, *ὀπῶπα*, I have seen, *ὄσσε*, *osse*, the two eyes, Lat. *oculus*, OChurch Slav. *oko*, Skt. *akṣan*, OHG. *ouga*, Ger. *Auge*, Goth. *augō*, AS. *ēage*, Eng. *eye*). A term originally used to denote inflammation of the eye generally, and still employed in that sense at times, but now usually restricted to designate inflammatory affections of the conjunctiva or mucous coat of the eye. (See CONJUNCTIVITIS.) Sympathetic ophthalmia is, however, a term applied to describe an inflammation in one eye due to a similar inflammation of the other. This usually follows perforation by foreign bodies or ulcer of the cornea, or operations in the ciliary region. The sympathizing eye is usually affected about five to eight weeks after the injury of the exciting eye. After one or more periods of irritability of the sympathizing eye, marked by dread of light, pain in the eye, lachrymation, and dimness of vision, the sympathetic inflammation comes on. Removal of the exciting eye before this takes place will prevent its occurrence. The course of the sympathetic inflammation is slow and it usually results in blindness in some months or one or two years. The cause of sympathetic ophthalmia is not positively known, but it is probably due to extension of infection through the sheath of one optic nerve by way of the optic chiasm to that of the nerve of the other eye. (See EYE.) Treatment consists in the removal of the exciting eye before the sympathetic inflammation develops; after this period it is of no avail. If the injured eye, however, possesses good vision, it is often advisable not to excise it as long as there are no signs of trouble in the other. The inflammation itself is treated as in cases due to other causes. See IRITIS.

OPHTHALMIC GANGLION. One of the four ganglia connected with the branches of the fifth cranial nerve, and thought to be a part of the great sympathetic nerve. It is about the size of a pin's head, and situated at the back part of the orbit, between the optic nerve and the external rectus muscle. It lies in a quantity of loose fat which makes its dissection somewhat difficult. It has three branches of communication (motor, sensory, and sympathetic), which enter its posterior border. The long branch (sensory) is derived from the nasal branch of the ophthalmic nerve (first division of the fifth nerve). The second branch or root (motor) is derived from a branch of the third nerve supplying the inferior oblique muscle of the eyeball. The third branch, or root, is a slender filament from the cavernous plexus of the sympathetic. According to Tiedemann this ganglion receives a filament of communication from Meckel's ganglion (q.v.). Its branches of distribution are the short ciliary nerves. These are 10 or 12 delicate filaments arising from the fore part of the ganglion in two bundles. They run forward with the ciliary arteries, pierce the sclerotic coat at the back

part of the globe, pass forward in delicate grooves on its inner surface, and are distributed to the ciliary muscle and the iris. It is therefore seen that the ophthalmic ganglion is one of the most important nerve centres in the whole body, although no larger than a pin's head. The ciliary muscle is the muscle of accommodation of the eye, causing variation in the form of the aqueous humor and the crystalline lens so as to accommodate the focal length of the eye to the distance of objects. Its supply of nerve force to the muscular fibres of the iris is also intimately connected with the focal length of the eye-apparatus.

The other three of the four ganglia above referred to are Meckel's (already described), the otic, and the submaxillary.

The otic (Arnold's) ganglion is a small, flattened oval body reddish-gray in color, situated immediately below the *foramen ovale* (through which the inferior maxillary nerve escapes from the cranial cavity). It is connected with the inferior maxillary, facial, and glossopharyngeal nerves, and with the sympathetic system, sending branches principally to the various parts of the tympanic cavity (middle ear), to which it serves much the same purpose that the ophthalmic ganglion does to the eye.

The submaxillary ganglion is a small fusiform body, situated above the submaxillary gland. It receives branches from the lingual, facial, and sympathetic nerves, and is distributed by five or six filaments to the mucous membrane of the mouth and the submaxillary gland, and indirectly, it is thought, to the sublingual gland.

OPHTHALMOL'OGY. See EYE; EYE, DISEASES OF.

OPHTHAL'MOSCOPE from Gk. *ὀφθαλμός*, *ophthalmos*, eye + *σκοπεῖν*, *skopein*, to view). An instrument invented by Helmholtz in 1851 for the purpose of examining the deep-seated structures of the eye, and for detecting disease in it. It is a concave circular mirror, of about 10 inches focus, having a hole in the centre, and mounted on a handle and accompanied by a set of convex and concave lenses. In the most approved forms the mirror is cut in approximately the form of a parallelogram and is so arranged as to be tilted toward either side. The lenses are placed near the circumference of a disk, by pressure upon the reeded edge of which they are brought successively before the opening in the mirror. Light is reflected into the interior of the eye by the mirror, and a portion returns, through the opening in the mirror and through the lens placed opposite it, to the eye of the observer.

OPHTHALMOSCOPIC EXAMINATION. (1) *Of the Media.*—In a darkened room, an Argand burner is placed several inches from either side of the patient, a few inches behind, and on a level with the eyes. Facing the patient, the observer looks through the perforation in the mirror, which is held about 15 inches from the patient's eye and reflects light into it. An orange-red reflex from the fundus is seen in the normal eye. Dark spots show opacities of the media or cornea; ametropia (see SIGHT, DEFECTS OF) is shown by ability to see the vessels in the fundus. (2) *Indirect Method.*—This gives an inverted image of the fundus. For both this and the direct method the pupil should be dilated by some mydriatic. The light is placed as before, and the ophthalmoscope is held at the same distance but with a positive lens of sufficient strength before the opening. The light is directed by the mirror into the eye through a strong convex lens held at its focal distance of about two inches in front of the patient's eye. By varying the distance of the mirror and lens an inverted image of the fundus is obtained. The fundus appears as an orange-red surface, darker in brunettes than in blondes, finely dotted by pigment cells. It is crossed by blood vessels which radiate from the optic disk, the arteries bright, the veins darker red and more tortuous. The optic disk is usually circular, pinkish, often bordered by a white ring of sclera, and an external dark ring formed by the choroid coat. The blood-vessels emerge from a depression at the centre of the disk. The appearance of the normal fundus varies greatly. (3) *Direct Method.*—This gives an erect image, magnified about 14 times, a smaller field at one time, allows estimation of errors of refraction by noting the lens which is necessary to give a clear view, and is less difficult. The light is placed on the side of the eye examined; the ophthalmoscope is held about one inch in front of the patient's eye. Different portions of the fundus are brought into view by movement of the eye of the patient. In this method correction by lenses must be made for errors of refraction of both patient and observer. Much practice is required for the skilful use of the ophthalmoscope, but it is now as essential in the diagnosis of diseases of the eye as the stethoscope is in that of thoracic affections. Those of other parts of the body may also be detected or confirmed by its use. For example, inflammation of the optic disk occurs in 90 per cent. of brain tumors.

O'PIE, AMELIA (ALDERSON) (1769-1853). An English novelist and poet. She was the second wife of John Opie (q.v.), the painter, whom she married in 1798. After her husband's death she lived at her father's house in Norwich. She was an attractive woman and occupied a high position in London society. On Sundays during her stay there, her house was thronged with visitors, including Sheridan, Sydney Smith, Byron, Scott, Wordsworth, and Humboldt. In 1825 she joined the Society of Friends and devoted herself to charitable work. Among her publications are: *Father and Daughter* (1801); *Miscellaneous Poems* (1802); *Adeline Mowbray* (1804); *Detraction Displayed* (1828); and *Lays for the Dead* (1833).

OPIE, JOHN (1761-1807). An English artist. He was born at Saint Agnes, Cornwall, and had but elementary village schooling. His early attempts at art won the notice of Dr. Wolcott ('Peter Pindar'), whose patronage secured for him important local custom. After he had already accomplished much in portraiture, he was in 1780 taken by Dr. Wolcott to London, where he was presented at Court, received numerous commissions from the fashionable world, and was known as the 'Cornish Wonder.' This favor was soon withdrawn, and the artist, well prepared for such an event, was left to supply his many defects in art and general culture. Still abundantly employed as a portrait-painter, he thoroughly acquainted himself with the Latin, French, and English literatures, and in 1786 sent seven canvases to the Academy. For a number of

years thereafter he exhibited frequently at the Academy, and illustrated such works as the Boydell *Shakespeare* and Macklin's *Poets*. In 1788 he was elected Academician, in 1805 was appointed professor of painting at the Academy, and in 1807 delivered before that institution four lectures which are a recognized part of permanent art-criticism. Severe application to work hastened his death. His works include: "James I. of Scotland Assassinated by Graham;" "The Assassination of David Rizzio;" "Arthur Supplicating Hubert;" "Jephtha's Vow;" and "The Presentation in the Temple." He contributed a biography of Reynolds to Dr. Wolcott's edition of Pilkington's *Dictionary of Painters* (1798).

OPINION (Lat. *opinio*, from *opinari*, to suppose; connected with *optare*, to hope, *apisci*, Skt. *āp*, to obtain) (of a court). A statement of the principles of law and legal reasons, which govern the court in reaching its decision in an action. It is usually handed down in writing, but may be delivered orally by a judge from the bench, in open court. When there are several opinions from several judges sitting together as a court, the opinion of the majority is the only one which has legal effect; and it is known as the 'opinion of the court' or the 'prevailing opinion.' The majority opinion usually contains, besides the reasons of the court, the application of the principles of law therein enunciated to the particular case, and a direction as to its disposition, and therefore includes the decision. For this reason, an opinion and a decision are sometimes confused, and an opinion is often defined as a written statement of the decision.

Where a judge in the course of an opinion expresses his views as to the law on some point which may be incidental to, but is not necessarily involved in, the issues before him, such part of the opinion is said to be *obiter dictum* (Lat., outside remark), or 'extra-judicial,' and has no absolute binding effect as a statement of the law, although it may be referred to in an argument on a mooted point of law, as the individual opinion of a learned judge. However, that part of the opinion which is necessary to the conclusion of the court is deemed a statement of the law, which inferior courts are bound to respect and follow. An opinion is a part of the record of a case, and is the authority for the entry of judgment.

The statutes of some States provide that certain public officers, such as the Governor, or a mayor of a city, may ask the courts for opinions on questions of law involving the public interests. For example, a Governor might ask for a judicial interpretation of an obscure statute creating a new public office. An opinion delivered under such circumstances may be considered as law. See DECREE; JUDGMENT.

OPINION EVIDENCE. See EVIDENCE; EXPERT.

O'PISTHOC'OMI (Neo-Lat. nom. pl., from Gk. *ὀπισθόκομος*, *opisthokomos*, wearing the hair long behind, from *ὄπισθεν*, *opisthen*, behind + *κομη*, *komē*, hair). Birds now regarded as a suborder of the Gallinæ, including only a single species, the remarkable hoactzin (q.v.). The order differs from other birds chiefly in the remarkable character of the sternum and shoulder-girdle. The clavicles are ankylosed with the coracoids and with the manubrium of the sternum. The latter has a pair of notches on each side of its posterior margin and the keel is cut away in front.

OPIS'THOGLYPH'A (Neo-Lat. nom. pl., from Gk. *ὄπισθεν*, *opisthen*, behind + *γλυφή*, *glyphē*, carving). A group of snakes of the family Colubridæ, characterized by the fact that one or more of the posterior maxillary teeth are grooved in front, and in most cases serve the purpose of poison-fangs, conveying venom from labial poison-glands. (Compare PROTEROGLYPHA.) They comprise about 300 species, occurring in all the warmer parts of the world excepting New Zealand, and containing terrestrial, arboreal, and aquatic forms. All are more or less poisonous, but so far as man is concerned are comparatively harmless, since the poison is not very strong, does not exist in large quantities, and the fangs stand so far back that the snakes cannot easily inflict wounds with them. The tree-snakes (Dipsas, Septognathus, etc.) of tropical South America and the cat-snake (q.v.) are conspicuous examples.

OPITZ, ō'pĭts, MARTIN (1597-1639). A German poet and literary reformer, born at Bunzlau, Silesia, December 23, 1597. He studied at Frankfort-on-the-Oder and at Heidelberg; visited, with his friend Hamilton, a Dane, the Netherlands and Jutland (1620); returned to Silesia (1621); occupied various subordinate confidential posts at small German courts; was knighted by the Emperor Ferdinand II. (1628), and died of the plague in Danzig, August 20, 1639. For a century after his death he passed for the Father of German Poetry, less for his mediocre verses than for his critical *Aristarchus, seu de Contemptu Linguæ Teutonicæ* ("or Scorn of the German Tongue") (1618), and his *Buch von der deutschen Poeterei* (1624, revd. 1876). Opitz borrowed his poetical theories mostly from Scaliger, Heinsius, and Ronsard. In 1627 he made the verses of the oldest German opera, *Dafne*, after Rinuccini, music by Heinrich Schütz. He laid great stress on Greek and Latin learning, urging that classic forms ought to be adopted in German poetry. Opitz laid down the law that rhythm must be pure, and there must be alternating masculine and feminine rhymes. The Alexandrine, a measure of French origin, which had come to be the standard French verse in the sixteenth century, he held up as the ideal for German poets. The influence of Opitz did much to secure the acceptance of the literary German of Luther in the Catholic States and so to make a common German literature possible. Opitz's works were incompletely gathered in three volumes (Breslau, 1690; Amsterdam, 1646; Frankfort, 1724). There are *Lives* by Strehlke (Leipzig, 1856); Hoffmann von Fallersleben (ib., 1858); Weinhold (Berlin, 1862); and Palm (Breslau, 1862). Consult also: Borinski, *Die Kunstlehre der Renaissance in Opitzens Buch von der deutschen Poeterei* (Munich, 1883); Witkowski, *Aristarchus und das Buch der Poeterei* (Leipzig, 1888); Scherer, *Kleine Schriften*, vol. i. (Berlin, 1893); Burdach, in *Forschungen zur deutschen Philologie* (ib., 1894); and Perry, *From Opitz to Lessing* (Boston, 1884).

OPIUM (Lat., from Gk. *ὄπιον*, poppy-juice, from *ὀπός*, *opos*, juice, sap). The dried juice of the unripe capsules of a species of poppy (q.v.), *Papaver somniferum*, sometimes called the com-

mon poppy, and sometimes the white poppy, although the latter name is really appropriate only to one of its varieties. The plant is probably a native of some of the warmer parts of Asia, although it is now common in cultivated and waste grounds throughout all the south and middle of Europe, and is occasionally found in Great Britain and the United States. It is an annual, varying in height from one to six feet erect, branched, of a glaucous green color, with ovate oblong sessile leaves, the stem and leaves generally smooth, the branches terminated by large flowers on long stalks, the capsules globose or roundish-ovate and smooth. There are two principal varieties cultivated for the opium which they yield, which have been regarded by some botanists as distinct species; the one (*Papaver somniferum*) having generally red or violet-colored flowers, numerous flower-stalks rising together, globose capsules opening by a circle of pores under the persistent stigma, and black seeds; the other (*Papaver officinale*) having white flowers, solitary flower-stalks, the capsules somewhat ovate, the circle of pores almost wanting, the seeds white. The former variety is generally cultivated in the mountainous parts of the north of India, the latter in the plain of Bengal. The cultivation of the poppy for the sake of opium is carried on in many parts of India, although the chief opium district is a large tract on the Ganges. The poppy is also extensively cultivated for opium in the Asiatic provinces of Turkey, in Egypt, and in Persia. It is a garden flower in the United States and Great Britain, but is not of commercial importance. The poppy requires for its profitable cultivation a rich soil, and in India is generally sown in the neighborhood of villages where manure can be easily obtained. The soil ought to be fine and loose when the seed in sown. The subsequent cultivation consists chiefly in thinning and weeding. Irrigation is practiced. Mild moist weather, with night dews, is deemed most favorable during the time of the collection of the opium. Very dry weather diminishes the juice, and much rain is injurious.

Opium, as a commercial article, is of great importance, exceeding that of any other drug in use. The seed is sown in India in the beginning of November; it flowers in the end of January, or early in February, and three or four weeks later the capsules or poppy-heads are about the size of hens' eggs, and are ready for operating upon. When this is the case, the collectors take a little iron instrument, called the *mishtur*, and wound each full-grown poppy-head in the field. This is always done in the afternoon and early on the following morning the milky juice which has exuded is collected by scraping it off with a kind of scoop called a *sittuoha*, and transferred to an earthern vessel called a *kurrace*. It is then transferred to a shallow open brass dish, which is left for a time tilted on its side, so that any watery fluid may drain out; this watery fluid is very detrimental to the opium unless removed. It now requires daily attention and has to be turned frequently, so that the air may dry it equally, until it acquires a tolerable consistency, which requires three or four weeks; it is then packed in small earthern jars and taken to the factories. The opium is then thrown into vast vats, which hold the accumulations of whole districts, and the mass being kneaded is again taken out and made into balls or cakes for the market.

The manufacture of opium is carried on to the greatest extent in India, but large quantities are also made in Turkey, and this latter is considered the best in quality. It is also made in Persia and Egypt; occasionally it has been produced in Germany, France, and England. Next to the Chinese the largest consumers of Indian opium are the Burmese and the natives of Malacca, who use annually an amount of the value of nearly $5,000,000.

In the United States and Europe opium is used chiefly for medicinal purposes, and large quantities of it undergo a still further stage of manufacture, in order to separate from it the active principles morphine, codeine, etc.

Physical and Chemical Properties. Good opium is a hard compact solid of reddish-brown color, which leaves an uninterrupted stain when drawn across paper, and breaks with a deeply notched fracture. It has a strong characteristic odor and a rather bitter, acrid taste. The pharmacopœia of the United States requires that it shall contain at least 9 per cent. of morphine, its most important alkaloid. A good Turkey opium contains 12 to 16 per cent. and should average about 14. Fifteen other alkaloids are found in opium, the most important being codeine, narceine, narcotine, and papaverine. It also contains meconic and other acids, gum, resinous and extractive matters, besides a volatile odorous principle. Although opium was cultivated for use before the Christian Era, morphine was not discovered until 1816.

Some of the most important and characteristic constituents are meconic acid, morphine, and narcotine. The only isolated constituents of opium now extensively used in medicine are *codeine*, which is less powerful and less narcotizing than morphine and which is very widely used as a nerve quietant, and also to control excessive cough, and it is used with good effect in diabetes mellitus; *morphine*, and two derivatives of morphine, *apomorphine* and *heroin* (q.v.). The salts of these alkaloids and derivatives are preferred on account of their greater solubility.

Physiological Action. (1) In *small doses*, as from a quarter of a grain to a grain, opium acts as an agreeable stimulant, producing a sense of well being, and stimulating the imagination by blunting the reason, judgment, and memory, this effect being followed by a desire to sleep, from which the person awakes unrefreshed or with some headache, depression, dryness of the mouth and throat, and slight constipation. When it is given in a *full medicinal dose* (as from two to four grains), the stage of excitement is soon followed by contraction of the pupils, well marked depression or torpor, both of the bodily and mental organs, and an almost irresistible sleepiness; these effects being usually succeeded by constipation, nausea, furred tongue, headache, and listlessness. Among Eastern nations, in whom the emotional element is strong, the imagination is highly stimulated, and the ingestion of opium is followed by loss of all disagreeable sensations with the onset of a delightful mental state, with gorgeous visions and a sense of happiness. Among the more stolid races the hypnotic effect is usually experienced at once, though some nervous persons experience terrible mental agony after even a small dose. When it is administered

in a dangerous or *poisonous dose*, the symptoms begin with giddiness and stupor, generally without any previous stimulation. The stupor rapidly increasing, the person becomes motionless, and insensible to external impressions; he breathes noisily and very slowly, with slow full pulse, the eyes shut, and the pupils contracted and not reacting to light; and the whole expression of the countenance is that of deep and perfect repose. As the poisoning advances the features become ghastly, the pulse feeble and imperceptible, the muscles exceedingly relaxed, respiration stertorous and constantly slower, and, unless assistance is speedily procured, death ensues from paralysis of the respiratory centre. If the person recovers, the insensibility is succeeded by prolonged sleep, which commonly ends in twenty-four or thirty-six hours, and is followed by nausea, vomiting, giddiness, and loathing of food. The treatment of acute morphine poisoning consists in removing the drug as far as possible, chiefly by washing out the stomach; in the administration of potassium permanganate; and in keeping the patient awake at any cost. This is accomplished by large doses of coffee, enforced exercise, and flagellation. If breathing is very slow artificial respiration may keep the person alive until the drug is eliminated. In case of failure of respiration or the heart suitable stimulants are employed. The effects of morphine are practically the same as those of opium, but it is less likely to derange digestion, is less constipating, less diaphoretic, and less tetanizing. When given hypodermically the stimulant effect is more marked and immediate.

(2) The *habitual use of opium*, whether the drug be eaten or smoked, is undoubtedly in most cases injurious to the constitution, although probably not to the extent that some Eastern travelers assert. In numerous cases very large quantities of this drug may be regularly taken with impunity.

Opium-Smoking is a habit that is chiefly confined to China and the islands of the Indian Archipelago. An extract, called *chandoo*, is made into pills about the size of a pea. One of these pills is put into the small cup at one end of the opium pipe; the pill being lighted, the smoke is inhaled and then exhaled through the nostrils. Although the immoderate practice of opium-smoking is most destructive to those who live in poverty and distress, it does not appear that the Chinese in easy circumstances, and with the comforts of life about them, are materially affected, in respect to longevity, by addiction to this habit. The Chinese practice the habit frequently, but in moderation, while those of Western races who become addicted to it carry it to an excess and soon show its degrading effects.

The 'morphine fiend,' as the victim of the morphine habit or chronic morphine poisoning is called, is pale, with parchment-like skin. He suffers from chronic digestive disturbance, pain in the region of the stomach, constipation, insomnia, irritability, mental and moral weakness, itching of the skin, and other disorders. With many the temptation to lie is not confined to statements in regard to their habit. The habit may be broken by immediate withdrawal of the drug or the dose may be gradually reduced. Diarrhœa is apt to occur when either plan is followed. Careful feeding and absolute control of the supply of the drug are essential.

There can be no doubt that the essential and primary operation of opium is on the nervous system, the other effects being for the most part secondary.

Opium is undoubtedly the most valuable remedy of the whole materia medica. We exhibit it not only to mitigate pain, to allay spasm, to promote sleep, to arrest vomiting and convulsions, to relieve nervous restlessness, to produce perspiration, and to check discharges from the bronchial tubes and intestinal canal; but we also find it capable of relieving some diseases in which none of the above indications can be always distinctly perceived. It is a valuable cardiac tonic and its action is almost miraculous in some cases of heart disease in which digitalis and other drugs have failed. It is a constituent of nearly all cough mixtures.

Its use is contraindicated in coma, in chronic uræmia, and in chronic diseases unless necessitated by pain which nothing else will relieve, as there is great danger of forming the habit. It is borne badly by children and by some adults. It must be used with great caution in some affections, and in painful abdominal conditions in which its effect may hide the presence of peritonitis or other grave affections. It may be administered by mouth, by rectum, or hypodermically. The best known preparations of opium in the United States Pharmacopœia (in addition to the alkaloid morphine and codeine) are laudanum, paregoric, and the mixture of opium and ipecac known as Dover's powder. For hypodermic use a solution in water of 16 grains of morphine to the ounce is frequently employed. It is known as 'Magendie's solution,' and is not official. See Antidote; Codeine; Heroin; Morphine; Laudanum. Consult Potter, *Handbook of Materia Medica, Pharmacy, and Therapeutics* (Philadelphia, 1901).

OPIUM WAR, The. A war between China and Great Britain which broke out in 1840, resulting from the attempt of the former to stop the opium trade with India. Though declared illegal in 1796, the importation of opium about 1840 amounted yearly to £1,500,000. Charles Elliott, the moderate British representative, was superseded by Sir Henry Pottinger, who carried on the war with such vigor that when it ended with the Treaty of Nanking (1842) China opened the treaty ports to foreign trade and ceded Hong Kong to Great Britain with an enormous indemnity. See Chinese Empire.

OP'ODEL'DOC (of obscure etymology, the first part apparently from Gk. *ὀπός, opos*, juice). A popular synonym for *soap liniment*. The term was apparently applied by Paracelsus to various forms of liniments or local applications. Soap liniment is composed of common soap, camphor, oil of rosemary, alcohol, and water, and is employed as a stimulating application for sprains, bruises, etc. See Liniment.

OPÓN, ō-pōn'. A town of Cebú, Philippines, situated on the small island of Maetán, opposite the town of Cebú (Map: Philippine Islands, H 9). Here Magellan was killed by the natives in 1521. Population, 11,506.

OPOP'ONAX (Lat., from Gk. *ὀποπάναξ*, juice of the plant panax, from *ὀπός, opos*, juice + *πάναξ, panax*, sort of plant, from *πᾶς, pas*, all +

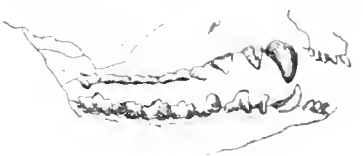
ἄκος, *akos*, cure). A gum resin obtained by puncturing the roots of a species of parsnip which grows in Persia (*Pastinaca opoponax*). The chief interest in this material is the great importance which the ancient physicians attached to it as an antispasmodic medicine. It is not much used, except for the preparation of a well-known perfume. It is practically obsolete in medicine.

OPOR'TO, *Port. pron.* u-pōr'to (Portug. *Porto, O Porto*, The Port). The second city of Portugal in population and importance. It is situated on the north bank of the Douro about three miles from its mouth, in the Province of Entre-Minho-e-Douro, District of Oporto, and 172 miles north by east of Lisbon (Map: Portugal, A 2). It is one of the most beautifully situated towns of the whole peninsula, being built on an amphitheatre of hills between two rocky headlands extending to the river banks, while the little village of Villa Nova de Gaia nestles in a similar position on the opposite side of the river. Like Lisbon, the city rises in a steep incline from the river side, the houses and gardens being terraced above one another with a very picturesque effect. The newer portions spread out over the upper slopes and are surrounded by wooded heights dotted with villas. Many of the streets in the older portion of the city are steep, narrow, and tortuous, but on the heights there are several wide avenues commanding fine views of the river and city below and of the ocean beyond. From the heights east of the city two magnificent iron bridges span the river. The first, that of Luiz I., crosses the river in a single arch of 560 feet span, and carries a roadway 200 feet above the water. It is rivaled in size and beauty by few other bridges of the kind in Europe. The second bridge, that of Maria Pia, is almost as large as the Luiz I., and carries a railroad. The centre of the business section of the city is the low-lying portion around the Praça de Dom Pedro, faced by the city hall on the north, and having in its centre a bronze equestrian statue of Pedro IV., Emperor of Brazil (as such Pedro I.). From this square the streets lead upward to the hills on either side, which are crowned on the west by the high and slender clock-tower of the Clerigos Church, and on the east by the cathedral. West of the Clerigos Church is the Jardim da Cordoaria, which, like the other garden-plazas of the city, has a luxuriant wealth of mingled southern and northern flora. Still farther west is another park containing the Crystal Palace, a large building erected for the industrial exposition of 1865, and now occupied by a theatre and ballrooms. Among other buildings worthy of note are, besides several churches, the exchange, a handsome building with a central court, and the English factory house, an imposing structure built in 1785, and used chiefly for club-rooms. Oporto is distinctly a modern city, and the commercial and industrial interests predominate. The chief educational institutions are the polytechnic academy and the schools of commerce and navigation, besides a school of medicine, and one of philosophy, and several colleges. There is a municipal library of 120,000 volumes.

About one-third of the population of Oporto are engaged in manufacturing industries, which are represented by distilleries, sugar refineries, tanneries, and manufactures of woolen, cotton, and silk fabrics, hats, preserved foods and beverages, soap, pottery, corks, tobacco, and jewelry. There are also a number of factories in Villa Nova de Gaia, on the south bank of the river, and here are large depositories for the well-known port wine. The only harbor facilities of Oporto formerly consisted of the quays along the banks of the river, which is here 600 feet wide. The water of the river is deep enough for large vessels, but the mouth is almost closed by a sandy spit prolonged into a bar. To avoid this bar a new harbor was completed in 1892 at Leixões, on the ocean front, 2½ miles north of the river-mouth, and connected with the city by a street railroad. This harbor is formed by two jetties or breakwaters, each about three-fourths of a mile long, and projecting into the ocean so as to form an artificial port with a narrow entrance. The total shipping of both harbors in 1900 amounted to 2765 vessels, aggregating 1,821,780 tons, and the total trade was valued at nearly $25,000,000, of which about $17,000,000 represented imports. The chief exports are wine, oil, and olives, raisins, oranges, lemons, onions, cork, salt, cattle, and building materials. The city is the seat of a United States consular agent. The population in 1890 was 139,856; and in 1900, 172,421.

In ancient times the site of Oporto was occupied by the harbor-town *Portus Cale*, afterwards *Porto Cale*, from which has been derived the name of the Kingdom, Portugal. It was an important city during the supremacy of the Arabs, was destroyed in 820 by Almansur of Cordova, but was restored and peopled by a colony of Gascons and French in 999. During the Middle Ages it was famous for the strength of its fortifications, its walls being 30 feet in height, and flanked with towers. In 1808 it was taken by the French; but in the following year it was retaken by an Anglo-Portuguese force under Wellington. In 1832-33 Dom Pedro, the ex-Emperor of Brazil, was unsuccessfully besieged in this city by the forces of Dom Miguel. Consult Sellers, *Oporto, Old and New* (London, 1899).

OPOS'SUM (from the American Indian name). The opossum (*Didelphus Virginiana*) is certainly the most distinctive and characteristic of American mammals, for not alone is it found only in America, but it is with a single exception (see MARSUPIALIA) the only marsupial mammal



DENTITION OF AN OPOSSUM.

found in the United States, and the family, to which the name opossum is now universally extended, does not occur except in America. This family, the Didelphidæ, is characterized, in distinction from the other marsupials, by numerous (18) small, subequal incisors, the canines larger, the molars with sharp cusps, and the hind feet with the four outer toes subequal, distinct, and having a well-developed, opposable hallux. The tail usually is long, naked, and prehensile. The

marsupial pouch is complete in the common opossum, but in most of the family it is rudimentary or wanting. The family includes only one genus besides Didelphys, and that is Chironectes, which contains the single species *variegatus*, the 'yapock' (q.v.) of South America.

The common or 'Virginia' opossum is widely distributed in the United States. It ranges as far north as southern New York State and southern Michigan; southward it extends through Mexico into Central and perhaps South America. The opossum is about as large as a big cat: it has rather short but equal legs, and a somewhat pig-like snout. The hair is coarse, of a yellowish tint, the tips of the hairs on the back and sides brownish or blackish, and intermingled with these are larger white hairs. The tail is scaly like that of a rat, but is hairy at the base. The brain is small, but the senses of smell and sight are well developed. The opossum is ordinarily a solitary animal, and except during the breeding two individuals are seldom found together. It is not exclusively arboreal, though fitted especially for such a life. It makes its retreat for the day chiefly in hollow trees, for it is nocturnal in its habits. The young, six to twelve in number, are brought forth in a nest of dried grass and leaves in some hollow in a stump or tree. The embryonic life lasts only about twenty-six days, when the young are born in a helpless condition and are transferred by the mother to the teats, where they are concealed and protected by the pouch. (See MARSUPIALIA.) They are at this time about the size of young mice, but grow rapidly and at the end of six weeks are large enough to leave the pouch and run about, but for the first few weeks thereafter they return to the pouch for shelter and protection. The food of the opossum is chiefly insects, but almost any available animal food will be used, especially reptiles, and birds' eggs and young. As an article of food the animal is in particular demand among the negroes of the South. Under the stress of capture, the opossum has the remarkable habit of simulating death, lying with closed eyes and limp muscles, until a favorable opportunity to make its escape. When so simulating, no amount of handling, kicking, or ordinary abuse will cause the animal to show signs of life, but if tossed into water it realizes its peril and resumes activity with great promptness.

The number of species of Didelphys and their geographical limitations are still in doubt, on account of great individual diversity, but there are probably about twenty good species, nearly all smaller than the common opossum, and many no larger than rats. The crab-eating opossum (*Didelphys cancrivora*) is an interesting Brazilian species, which feeds chiefly upon crustacea and is consequently found most commonly in swamps. One of the species from Surinam (*Didelphys dorsigera*) carries the young, after they leave the teats, on the back of the mother, with their tails twined around hers, and this method of caring for the young is common to various other species in which the pouch is rudimentary or wanting. Several of the Peruvian opossums are remarkable from their habit of living mainly upon fruit. Among the smallest species may be mentioned the mouse-opossum (*Didelphys murina*), a little larger than a mouse, bright red in color, and ranging from Mexico through Brazil; and the three-striped opossum (*Didelphys Americana*) of Brazil, which is very small and shrew-like, without a prehensile tail, of a reddish-gray color, with three distinct black stripes down the back. The name opossum is used in Australia for several mammals of widely different families, and not entitled to the name. See Colored Plate of MARSUPIALS; and Plate with CARNIVORA.

OPOSSUM-MOUSE. One of the diminutive, mouse-like flying phalangers of New South Wales, of the genus Acrobates, whose appearance and habits, not only, but even its dentition approach a murine type. It is the smallest of marsupials.

OPOSSUM-RAT. A name given to a little marsupial (genus Cænolestes) representing the otherwise extinct Patagonian family Epanorthidæ, rediscovered at the end of the nineteenth century in Colombia and Ecuador. It is of particular interest because otherwise the only marsupials in the New World were those of the family Didelphidæ, which is polyprotodont, while Cænolestes belongs to the diprotodont division of marsupials. Consult Thomas, *Proceedings of the Zoölogical Society of London* for 1895. See MARSUPIALIA.

OPOSSUM-SHRIMP (so called because the female carries the eggs in pouches between the thoracic legs). A small, shrimp-like marine crustacean of the order Schizopoda and genus Mysis. See CRUSTACEA.

OP'PELN. The capital of a district and a river port in the Province of Silesia, Prussia, on the Oder, 51 miles by rail southeast of Breslau (Map: Prussia, II 3). The Church of Saint Adalbert is believed to have been founded by Adalbert, Bishop of Prague, in 995. The so-called new castle of the Dukes of Silesia, dating from the fourteenth century, is situated on an island in the Oder and is used as a Government building. The educational institutions of the town include a gymnasium, a seminary for teachers and a school of agriculture. Oppeln manufactures cement, cigars, machinery, barrels, etc., and trades in grain and cattle. From 1288 to 1532 Oppeln was the residence of the dukes of Oppeln. It came into the possession of Prussia in 1742. Population, in 1890, 20,300; in 1900, 30,115, chiefly Polish-speaking Roman Catholics. Eduard Schnitzer (Emin Pasha, q.v.) was born at Oppeln.

OPPER, FREDERICK BURR (1857—). An American illustrator. He was born at Madison, Lake County, Ohio, January 2, 1857, and after a brief experience in newspaper work, in 1872, he came to New York City, where he entered the employ of a mercantile house, devoting his leisure to drawing. He produced some clever sketches, which he sold to comic papers, and after attending one term of the evening class in drawing at the Cooper Union Institute, he devoted himself to drawing as a profession. He studied for a time with Frank Beard, the designer, whom he assisted in his work. From 1877 to 1880 he was engaged on Frank Leslie's publications, then became illustrator for *Puck* until May, 1899, since which time he has been employed by the New York *Journal*. Opper has illustrated the writings of Bill Nye and Mark Twain, Hobart's *Dinkelspiel*, and Peter Dunne's *Mr. Dooley*, and has himself published *Folks in Funnyville* and a col-

lection of drawings entitled *Puck's Opper Book*. While lacking the highest artistic and technical qualities, Opper's illustrations are forcibly executed and are characterized by fine humor. His political cartoons have been of notable influence in several Presidential campaigns.

OPPERT, ô'pâr', JULES (1825—). A French Orientalist, born at Hamburg. He studied law at Heidelberg, Oriental languages at Bonn and Berlin, and obtained the degree of doctor of philosophy at Kiel in 1846, with a thesis *De Jure Judiciorum Criminale*. In 1848 he was elected professor of German in the Lyceum of Laval, and in 1850 to the same position at Rheims. His interest in Oriental studies still continued, however, and in 1851 he was appointed a member of the expedition sent by the French Government to Mesopotamia. On his return in 1854 he laid his system of deciphering the Assyrian inscriptions before the Institute. In 1857 he was made professor of Sanskrit at the Imperial Library in Paris, in 1869 teacher of Assyriology in the College of France, and in 1874 he was elected professor. Among his works are: *Les inscriptions des Achéménides* (1852); *Expédition scientifique en Mésopotamie* (2 vols. and atlas, 1859-64); *Grammaire sanscrite* (1859); *Les fastes de Sargon* (1864); *Histoire des rois de Chaldée et de l'Assyrie* (1866); *Eléments de la grammaire assyrienne* (2d ed. 1868); *Documents juridiques de l'Assyrie et de la Chaldée* (with J. Menant, 1877); *Le peuple et la langue des Mèdes* (1879); as well as translations of inscriptions, and many monographs and contributions to periodicals. He has been one of the editors of the *Revue d'Assyriologie*. A full list of his articles may be found in Haupt and Delitzsch, *Beitrage zur Assyriologie*, vol. ii. (Leipzig, 1891).

OP'PIAN (Lat. *Oppianus*, from Gk. Ὀππιανός, *Oppianos*). (1) A Greek didactic poet, who flourished in the reign of Marcus Aurelius. He was born in Coryeus in Cilicia of a wealthy and distinguished family. When the Emperor Verus visited Coryeus, Oppian's father failed to join in the general manifestations of adulation, and therefore was banished to the island of Melita in the Adriatic. Oppian accompanied him in his exile, and after the death of Verus (A.D. 169) won such favor with Marcus Aurelius by means of his poem in five books on fishing, *Halieutica* (Ἁλιευτικά), dedicated to the Emperor and his son Commodus, that the Emperor not only granted him his father's release from exile, but, according to the tradition, paid him a piece of gold for every verse. The poem is written in a smooth but ornate and artificial style, and at times descends to bombast. The high esteem in which it was held in antiquity is to us incomprehensible. Oppian died in his thirtieth year; his native town honored his memory with a statue.

(2) To this same Oppian the ancient writer of his *Life* falsely attributes two other didactic poems, one on hunting in four books, *Cynegetica* (Κυνηγετικά), the other, now lost, on bird-catching, *Ixeutica* (Ἰξευτικά). But it is clear from internal evidence that the *Cynegetica* was not written by the earlier poet, for it is dedicated to the Emperor Caracalla and apparently was composed in A.D. 212; furthermore, the author speaks of his home as Apamea in Syria; and finally the metrical structure is inferior to the careful elegance of the *Halieutica*. The *Ixeutica* is possibly preserved in a paraphrase by a certain Dionysius. The best edition of the *Halieutica*, *Cynegetica*, and the paraphrase, is by Lehrs in his *Poetæ Bucolici et Didactici* (Paris, 1846). There is an English translation of the *Halieutica* by Draper and Jones (Oxford, 1722), and of the *Cynegetica* by Mawer (London, 1786). See also Ausfeld, *De Oppiano et Scriptis sub eius Nomine Traditis* (Gotha, 1876).

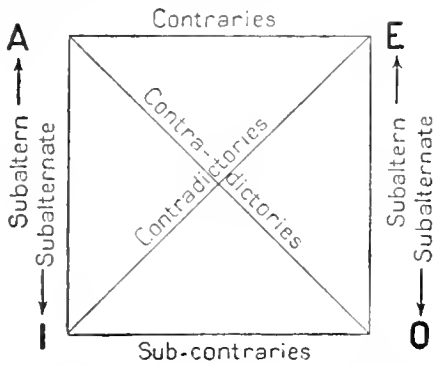
OP'PIUS, CAIUS. A Latin writer. He was an intimate friend of Julius Cæsar, and in conjunction with Balbus managed all affairs at Rome during the dictator's absence in Spain. He wrote biographies, not now extant, of Cæsar, Cassius, and Scipio Africanus, the elder, and was regarded by some as the author of the continuation of Cæsar's *Commentaries*, the *De Bello Alexandrino*, *De Bello Africano*, and *De Bello Hispaniensi*. This theory, however, is untenable as to the last two, and improbable as to the first. Consult Nipperdey, *De Suppletionis Commentariorum Cæsaris* (Berlin, 1846).

OPPOLZER, ôp'pol-tsĕr, JOHANN VON (1808-71). An eminent Austrian physician. He was born at Gratzen, Bohemia, and studied medicine in Prague, where he practiced for some time and in 1841 became professor in the medical clinic. For two years he was professor of special pathology and therapy in Leipzig, and in 1850 was called to the university at Vienna, where his name contributed much to the fame of the medical faculty. He was widely known as a clinicist and for his opposition to 'nihilism' in therapeutics. His *Klinische Vortrage* (1866-72) were edited by Stoffella.

OPPOLZER, THEODOR VON (1841-86). An Austrian astronomer, son of the preceding. He was born in Prague. In 1866 he was appointed docent and in 1870 professor in the University of Vienna. In 1884 he began his important studies on the pendulum. His earlier research had been on the orbits of planets and comets. His publications include: *Lehrbuch zur Bahnbestimmung der Kometen und Planeten* (1870-80), the best and most complete work of this kind; *Ueber die Bestimmung einer Kometenbahn* (1868-71); *Syzygientafeln für den Mond* (1881); *Kanon der Finsternisse* (1887), with tales of eclipses of the sun between B.C. 1207 and A.D. 2163; and *Entwurf einer Mondtheorie* (1886).

OPPOSITION. In logic, the name applied to express the relation between propositions which have the same subject and the same predicate, but which differ in quality or in quantity, or in both. Thus "All cows ruminate" and "Some cows ruminate" stand in opposition or are opposites, because they have the same terms ('cows' and 'ruminate') but differ in quantity. If opposites differ only in quantity, the universal proposition is called the subaltern and the particular the subalternate. When the opposites differ only in quality and are both universal, they are said to be contraries; if they are both particular and differ only in quantity, they are said to be subcontraries. If the opposites differ in both quantity and quality, they are said to be contradictory. These relations are generally represented graphically in the so-called 'square of opposition,' in which the symbols A, E, I, O, stand for the four mutually opposing propositions. See LOGIC.

From this square probably arises the expression 'squarely contradictory.' An 'immediate inference by opposition' is made when from the known or granted truth or falsity of any proposition, the truth or falsity of its opposites is inferred. Thus, if A be true, E and O are false and I is true. If E be true, A and I are false



and O is true. If I be true, E is false, and either—not both—A or O is true; which is true cannot be inferred from the premise. If O be true, A is false, and either—not both—E or I is true; which is true cannot be inferred from the premise. On the other hand, if A be false, O is true, and either—not both—I or E is true; which is true cannot be inferred from the premise. If E be false, I is true, and either—not both—A or O is true; which is true cannot be inferred from the premise. If I be false, E and O are true, and A is false. If O be false, A and I are true and E is false.

OPTIC, Oliver. The pen-name of William Taylor Adams (q.v.).

OPTICAL ILLUSION. See Illusion.

OPTICALLY ACTIVE SUBSTANCES. See Light, section *Rotation of the Plane of Polarization.*

OPTIC AXIS. See Light.

OPTIC NERVE. See Eye.

OPTIC NEURITIS. Inflammation of the optic nerve may be (1) papillitis, in which the optic disk is affected, or (2) retrobulbar neuritis; in which the disk is but slightly involved and the changes are in the nerve fibres behind the eye. In papillitis both eyes are usually involved, most frequently as the result of brain tumor, meningitis, abscess of the brain, or hydrocephalus. Syphilis is a common cause, and less frequently acute febrile affections, general diseases and inflammations in the region of the eye. The only subjective symptom is impairment of vision. The ophthalmoscope (q.v.) shows a condition known as choked disk, in which the optic disk is swollen, its edges indistinct and fringed, the veins dilated and tortuous, or less projection of the disk and involvement of more of the surrounding retina. The inflammation runs a chronic course and may terminate in recovery or be followed by atrophy of the nerve with consequent loss of sight to a varying degree. Retrobulbar neuritis may be acute or chronic. The former is rare, and results from rheumatism, syphilis, exposure, acute infectious diseases, and poisons. There is neuralgia, pain in the eye and near it, rapid loss of sight, while even ophthalmoscopic examination shows little or nothing. Sight usually returns within a few months, but often with a central scotoma; sometimes there is partial or total blindness. The chronic form is usually the result of excessive use of tobacco and alcohol, separately or combined. Both eyes have gradually diminished vision. (See Amblyopia.) If the patient gives up the use of the drug causing the neuritis complete recovery may occur; on the other hand, there may be partial loss of sight.

OPTICS. See Light.

OPTIMATES (Lat., aristocrats) **AND POPULARES** (Lat., democrats). In the politics of later republican Rome, the conservative or aristocratic, and the democratic or progressive, parties respectively. The *populares* comprised the great body of the people, including not only the proletariat, but many men of wealth, who, however, were generally without personal influence. The *optimates* were the aristocracy and their followers. The two parties perpetuated the old contests between the patricians and plebeians. In the second century B.C. the *populares* gained great power under Tiberius Gracchus and his brother Gaius, whose drastic measures were, however, nullified at their deaths. From this time until the Empire, politics entered less into the controversies of the *optimates* and *populares* than did the personal ambitions of the leaders. Marius, the leader of the *populares*, was overthrown by Sulla in the name of the *optimates*, and, later on, Cæsar led the party of the *populares* in opposition to the aristocracy at whose head was Pompeius. See Cæsar, Gaius Julius; Gracchus; Marius; Pompeius; Sulla.

OPTIMISM (from Lat. *optimus*, best; connected with *optare*, to choose, *apisci*, Skt. *āp*, to obtain). The name given to the doctrine of those philosophers and divines who hold that the existing order of things, whatever may be its seeming imperfections of detail, is nevertheless, as a whole, the most perfect or the best which could have been created, or which it is possible to conceive. Some of the advocates of optimism content themselves with maintaining the dogmatic position, that although God was not by any means bound to create the most perfect order of things, yet the existing order is *de facto* the best; others contend, in addition, that the perfection and wisdom of almighty God necessarily require that His creation should be the most perfect which it is possible to conceive. The full development of the optimistic theory as a philosophical system was reserved for Leibnitz (q.v.). His main thesis may be briefly stated to be that among all the systems which presented themselves to the infinite intelligence of God, as possible, God on account of His goodness selected and created, in the existing universe, the best and most perfect, physically as well as morally. The details of the controversial part of the system would be out of place in this work. It will be enough to say that the existence of evil, both moral and physical, is explained by Leibnitz as a necessary consequence of the finiteness of created beings; and it is contended that in the balance of good and evil in the existing constitution of things, the preponderance of the former is greater than in any other conceivable creation. The great argument of the

optimists has always been in essence identical with Leibnitz.

OPUNTIA, ō-pŭn'shĭ-ȧ. A genus of cacti. See PRICKLY PEAR.

OPZOOMER, ŏp'zō-mēr. CORNELIS WILLEM (1821-92). A Dutch philosopher and jurist, born at Rotterdam. He studied at the University of Leyden, became professor of philosophy at the University of Utrecht in 1846, and in 1861 was chosen president of the Royal Academy of Science. He was a leader of the empirical school of philosophy. Among his works are: *De weg der wetenschap* (1851); *Het wezen der kennis* (2d ed. 1867); *De Bonapartes en het recht van Duitschland, ook na Sedan* (1871); and *Scheiding van Kerk en Staat* (1875).

OQUAS'SA TROUT (North American Indian name). The blueback trout, or 'quasky,' of the Rangeley lakes, Me. See Plate with TROUT.

OR (Fr., gold). In heraldry (q.v.), the metal gold.

ORACHE (formerly also *arrach*, from Fr. *arroche*, from Lat. *atriplex*, orache, from Gk. *ἀτράφαξις*, *atraphaxis*, orache). *Atriplex*. A large genus of plants of the natural order Chenopodiaceæ, some species of which are common weeds in gardens and waste places throughout Europe and the United States. Garden orache, mountain spinach (*Atriplex hortensis*), an annual native of Tatary, with thick greenish or reddish slightly acid leaves, was formerly much cultivated as a substitute for spinach. Sea orache (*Atriplex littoralis*), a native of the British coasts, and *Atriplex patula*, a garden weed, are similarly used.

ORACLE (Lat. *oraculum*, from *orare*, to pray, from *os*, Skt. *asya*, mouth). The place where a deity gives responses to the inquiries of votaries, or the response itself. The belief that the gods could and would reveal the future was common among the nations of antiquity, and few undertakings were entered upon without consultation of those who were able to interpret the signs by which the future was manifested. Thus we find the kings of Egypt, Babylonia, and Assyria seeking divine advice or sanction before their campaigns, while among the Hebrews the high priest made use of the Urim and Thummim to determine the will of Jehovah. The Greeks and Romans were fully convinced of the importance of signs and omens, and the need of their correct interpretation, as well as of the possibility of predicting the future by means of various methods, which are treated under DIVINATION. While consultation of the gods was thus possible anywhere, there were certain places especially chosen by the gods as seats of answer to human inquiries, and these oracles played an important part in ancient life. They were naturally connected with sanctuaries, and the answers were usually imparted or interpreted by the priests. The number of such oracular shrines was very great, and most of them doubtless enjoyed little more than a local reputation. Only a few reached a national or international importance, but these may fairly be taken as typical. They fall naturally into three classes: (1) those in which the answer was given through signs; (2) those in which the god spoke through the mouth of some inspired person; (3) those in which the god manifested his will by dreams or visions in the sanctuary.

In the first class belongs the very ancient oracle of Zeus at Dodona (q.v.) in Epirus, where answers seem at first to have been given by the rustling of the leaves of the sacred oaks, though later other methods of divination, including the lot, were also employed. At Olympia the family of Iamidæ, in whom the prophetic gift was hereditary, answered inquiries and predicted the future from the sacrifices at the great altar, and a similar method was followed in early times at the oracle of Ismenian Apollo near Thebes. Next to Dodona, and in later times surpassing it in fame, was the oracle of Zeus Ammon, in the oasis of Siwah in Libya, noted for the visit of Alexander the Great, who was there hailed as the divine son of Ammon. It was, however, frequently consulted by Greeks in earlier times. The answers were determined by the swaying of the image of the god, as it was carried in solemn procession on the shoulders of the priests. At some places the answer was given by casting lots, or throwing dice bearing characters or numbers, which were interpreted by the priests or by a key. Thus at Attaleia in Phrygia the numbers referred to a collection of oracles in verse, and the answer was sought in the verses indicated by the number.

The second class were far more numerous, and seem to have been prevailingly oracles of Apollo, for this god was the special minister of Zeus in declaring the future. Here belongs far the most famous of the ancient oracles, that of the Pythian Apollo at Delphi (q.v.). The responses were here given by a prophetess, the Pythia, who after ceremonial purifications drank from the sacred water of the Cassotis, chewed leaves of the sacred laurel, and seated herself on the sacred tripod, which was placed in the shrine of the temple over a subterranean chasm from which issued a cold vapor, whose fumes threw her into an ecstasy. The questions were propounded by a prophet, and the mutterings or ravings of the Pythia were reduced by the priests to hexameter verses, and thus communicated to the inquirer. Responses were at first given in but one month each year; later, however, they could be obtained on all but unlucky days. The favorable days were determined by examining the sacrificial victims. The order of the inquirers was determined by lot, unless precedence in consulting the oracle had been granted as a mark of honor by the community. The oracle early attained wide fame, and in the sixth century B.C. received rich gifts from King Croesus of Lydia. Later it was frequently consulted by Athenians, Spartans, and other peoples before venturing to decide critical questions of policy, especially in matters connected with religion. In spite of *Medism* during the Persian wars and some undoubted cases of deception, the oracle maintained its reputation through the best period of Greek history, and with some fluctuations enjoyed prosperity even under the Roman emperors. Other famous oracles of Apollo where inspired prophets or prophetesses revealed the answers of the god were at Branchidæ near Miletus, at Abæ in Phocis, at Claros near Colophon, at Patara in Lycia, and at Argos. The inspiration was in most cases communicated by drinking from a sacred spring or of the blood of a sacrifice.

The third class of oracles finds its best examples in the temples of Æsculapius (q.v.), where the sick who came to consult the god slept in a hall attached to the sanctuary, and were either cured by a vision of the god during the night, or received directions which were later interpreted to them by the attendants. The most celebrated of these shrines was the Hieron of Epidaurus (q.v.), and the inscriptions found there throw much light upon the character of these establishments. The dream-oracles were not confined, however, to the sick. In the sanctuary of Amphiaraus at Oropus in Attica visions not only helped the sick, but enlightened the inquirer on other subjects. Before the incubation certain sacrifices and purifications with fasting were required, and fees were of course collected, especially from those who had been cured of disease. Peculiar in many ways, and not above a very strong suspicion of charlatanry, was the procedure at the oracle of Trophonius at Lebadea in Bœotia. After prolonged preparatory rites and sacrifices, the inquirer, a honey cake in each hand, descended by a ladder into an artificial subterranean chamber, where he thrust his feet through a hole in the side wall. He was then seized by some unseen power and borne below the earth, where by apparitions or voices the future was revealed, and he then found himself hurried feet foremost into the chamber he had left, whence he was removed by the priests in a dazed and bewildered condition. By Lake Avernus, near Cumæ, in Italy, was a celebrated oracle where the future was revealed by the spirits of the dead, and we hear of other places where necromancy was practiced, either by calling the spirits in person to answer the inquirer, or by means of dreams.

As it was believed that many of the great prophets of the past had predicted the distant future, there were also in circulation in the ancient world many collections of oracles attributed to Bacis, Musæus, Orpheus, and other famous seers, and these predictions were freely cited at any time of national calamity or consulted for guidance in difficulties by the less educated.

Consult: Bouché-Leclerq, *Histoire de la divination* (Paris, 1879); Stengel, "Griechische Kultusaltertümer," in Müller's *Handbuch der klassischen Altertumswissenschaft* (Munich, 1898); Buresch, *Klaros* (Leipzig, 1889); Stützle, *Das griechische Orakelwesen* (Ellwangen, 1887, 1891); Schömann-Lipsius, *Griechische Altertümer*, vol. ii. (Berlin, 1902).

ORAN, ô-răn′ *Fr. pron.* ô′răN′. A department of Algeria, sometimes called the Department of the West, from the fact of its forming the western frontier of the country. It is bounded on the north by the Mediterranean, on the east by the Department of Algiers, on the west by the Empire of Morocco, and on the south by the desert. Area, 44,616 square miles, of which 13,514 belong to the Tell and a large portion to the Sahara. Population, in 1891, 942,000; in 1901, 1,107,354, four-fifths being Arabs. Besides the capital, Oran (q.v.), the seats of arrondissements are the communes of Sidi bel-Abbès (population, in 1901, 25,739), Mostaganem (population, 17,956), Mascara (population, 20,914), and Tlemcên (population, 35,382).

ORAN (Ar. *Waran*). A seaport and Catholic episcopal city of Algeria, capital of the department of the same name. It stands at the inner extremity of the Gulf of Oran, an inlet of the Mediterranean, 260 miles west-southwest of Algiers, with which it is connected by rail (Map: Africa, D 1). The town, girt by walls and defended by strongly armed forts, is situated at the foot of a high mountain, crowned by the forts Santa-Cruz and Saint-Grégoire. The ravine of Oued Rekhi, laid out with boulevards and buildings, divides the port and old Spanish town on the west from the modern French town on the east. The streets and promenades are generally spacious, the houses elegant and airy. The principal edifices are the Château-Neuf, the residence of the general of division; the departmental offices, including the Hôtel de la Préfecture, the civil, criminal, commercial tribunals, etc.; the great mosque of la Rue Philippe; the Catholic cathedral, and the barracks. The city has a college, primary and native schools, a geological and archæological society, Protestant and other churches, synagogues, mosques; a branch of the Bank of Algeria; exchequer, post, and telegraph offices; an immense military hospital, with accommodations for 1400 beds; and various splendidly appointed magazines and Government stores. The town has a good water supply. Formerly vessels had to find shelter in the roadstead of Mers-el-Kebir, three miles distant, but the construction of moles since 1887 has improved the harbor, and vessels with an aggregate tonnage of 2,310,000 entered and cleared the port in 1898. There is a large trade with interior Africa and with Spain, Almería being only 140 miles and Gibraltar 220 miles distant. The exports include agricultural produce, iron ore, and alfa. The United States is represented by an agent. The country in the vicinity is bare and arid, although the land is not sterile. To the south of the town the country is uncultivated, but toward the southeast highly cultivated lands are seen. Cattle are raised, and grain, tobacco, and cotton are grown. The vine covers large tracts of land, and its cultivation is attended with great success; the wines produced are of good quality.

The town of Oran was built by the Moors. It was taken by the Spaniards in 1509, by the Turks in 1708, and again by the Spaniards in 1732. In 1791 it was destroyed by an earthquake, and shortly after it was altogether abandoned by the Spaniards. Oran was taken by the French in 1831, and has been developed by them into a large and prosperous town. Population of commune, comprising the three suburbs, Mers-el-Kebir, La Senia, and Aïn-el-Turk, in 1891, 75,000; in 1901, 88,235.

ORANGE, ô′răNzh′. The capital of an arrondissement in the Department of Vaucluse, France, in a beautiful plain, on the Aigue, 18 miles north of Avignon by rail (Map: France, L 7). There are several notable Roman remains here and in the vicinity. The triumphal arch, 60 feet high, is celebrated for the beauty of its architecture, and its richly sculptured bas-reliefs. The ancient theatre, the largest of its kind in France, has a well-preserved stage. The Church of Notre Dame dates from the eleventh century. Orange has a college and a library. It had a university till the French Revolution. It manufactures silks, mus-

lins, serges, etc., and there are oil-works, dye-works, and tanneries. A trade in wine, spirits, oils, honey, and fruit is carried on. Population, in 1901 (commune), 10,096.

Orange is the Roman Arausio. It was the capital of the independent Principality of Orange from the eleventh century. On the death of Philibert of Chalon in 1530 the estates and title passed to the House of Nassau. William of Orange, surnamed the Silent, and his son, Maurice of Nassau, founded the greatness of the House of Orange by the rôle which they played in the foundation of the Dutch Republic. (See NASSAU and NETHERLANDS.) William III., Prince of Orange and King of England, died in 1702 without issue; and at the Peace of Utrecht (1713) the King of Prussia, one of the principal claimants to the principality, ceded the territory of Orange to the King of France. The title Prince of Orange is now borne by the heir presumptive to the Dutch throne.

OR'ANGE. A town, including several villages, in Franklin County, Mass., 86 miles west by north of Boston; on Millers River, and on the Boston and Maine Railroad (Map: Massachusetts, C 2). It has a public library of 7000 volumes. Its parks—Central, Brookside, and Goddard—are very attractive. The town is actively engaged in manufacturing, the products including sewing-machines, sewing-machine needles, furniture, lumber products, clothing, especially Russian vests, boxes, tapioca, automobiles, water wheels and other kinds of machinery. The government is administered by town meetings. The water-works are owned and operated by the town. In 1783 Orange was created out of parts of Warwick, Athol, Royalston, and New Salem, and incorporated as a district. In 1810 it became a town. Population, in 1890, 4568; in 1900, 5520.

ORANGE. A city in Essex County, N. J., four miles northwest of Newark; on the Lackawanna Railroad, a branch of the Erie, and electric railroads connecting with Newark, Montclair, Bloomfield, East Orange, South Orange, and other towns of the vicinity (Map: New Jersey, D 2). It is situated at an elevation of from 150 to 200 feet, near the base of First (Orange) Mountain, a great ridge of trap rock, which extends for many miles in a northeast and southwest direction rising to a height of over 600 feet above tide water. Among the picturesque spots in the neighborhood are Llewellyn Park of 750 acres (West Orange), with many fine residences; Eagle Rock, on the east brow of the mountain, now a part of the new public park system of Essex County; and Hemlock Falls (South Orange), situated amid wild scenery. The city is noted as a residential place, having the homes of many New York business men, and from its elevated suburbs commands magnificent views of the surrounding country. In the city and vicinity are many miles of excellent roads. The noteworthy buildings include the Stickler Memorial Library, Columbus School Building and Theatre, Decker Building, Metropolitan Building, Music Hall, Orange Memorial Hospital, with the Shepard pavilion and a training school for nurses, Orphan Home, House of the Good Shepherd, Masonic Temple, and the First Presbyterian Church, originally built in 1719, and several times remodeled. The city has a public library, a bureau of associated charities, a well-known Mendelssohn Union, a New England Society, Essex County Hunt and Essex County clubs, and other athletic and social clubs. Orange is widely known also as the seat of an extensive hat-manufacturing industry. Adjoining Llewellyn Park is the Edison laboratory. The government, under a revised charter of 1879, is vested in a mayor, biennially elected, and a council. The board of education is independently elected by popular vote. The water-works are owned and operated by the municipality. Population, in 1890, 18,844; in 1900, 24,141.

Orange, originally a part of Newark and called the 'Newark Mountain,' was probably settled as early as 1666 or 1667. In 1718 the settlers established a separate Church and called it "The Mountain Society.' This in 1781 became the 'Second Church of Newark,' and still exists as the 'First Presbyterian Church of Orange.' In 1806 Orange was separated from Newark and incorporated as a town under its present name, the name Orange Dale having been in use from about 1791. In 1870 it was chartered as a city. Out of Orange were created South, West, and East Orange in 1861, 1862, and 1863 respectively. Consult: Whittemore, *The Founders and Builders of the Oranges* (Newark, 1896); and Wickes, *History of the Oranges from 1666 to 1806* (Newark, 1892).

ORANGE. A city and the county-seat of Orange County, Texas, 271 miles east of Austin; on the Sabine River, and on the Southern Pacific Railroad (Map: Texas, H 4). It is especially noted for its extensive lumbering interests, and is also an important shipping centre for the rice, cotton, and live stock of the vicinity. Lumber mills, cotton gins, and a rice mill constitute the principal industrial establishments. The water-works are owned by the municipality. Population, in 1890, 3173; in 1900, 3855.

ORANGE (OF. *orenge*, Fr. *orange*, from It. *arancia*, *arancio*, from Ar. *nāranj*, orange, from Hind. *nārangī*, from Skt. *nāraṅga*, *nāgaraṅga*, orange; influenced by popular etymology with Fr. *or*, Lat. *aurum*, gold, in allusion to its yellow color; with loss of initial *n* as in *adder*, *apron*, *auger*, *umpire*, cf. dial. It. *naranza*, *naranz*, Sp. *naranja*, Wall. *narance*, orange). *Citrus aurantium*. A low-branching, long-lived evergreen tree of the natural order Rutaceæ. In cultivated orchards it seldom exceeds 30 feet in height. The leaves are oval or elliptical; the blossoms pure white and very fragrant. The fruit is a large, globose, 8- to 10-celled berry, yellow when ripe, and containing a refreshing acid juicy pulp. The orange is used as a dessert fruit and for preserves, marmalade, etc. The principal types of oranges are as follows: *Citrus aurantium sinensis*, which includes the common sweet oranges of commerce, including more than 70 horticultural varieties. *Citrus aurantium amara*, which includes the sour, bitter, or Seville oranges, largely used as budding stocks for sweet oranges and for the oil obtained from the rind of the fruit for use in perfumery. *Citrus aurantium bergamia*, which includes the bergamot orange, from which bergamot oil is obtained. The species *Citrus aurantium*, var. *nobilis*, includes the mandarin or kid-glove oranges, and tangerines. These are mostly small early sorts and hardier than sweet oranges.

The trifoliate orange (*Citrus trifoliata*) is valuable chiefly on account of its hardiness and compact growth, which makes it a good hedge plant as far north as New York City. It has a value as a stock for the Satsuma variety and the kumquat, rendering them more hardy than when worked on their own roots. Promising hardy hybrids between this and *Citrus aurantium* are being obtained.

The fruit of these various species varies exceedingly in form, size, juiciness of pulp, thickness of rind, etc. Some varieties have very numerous seeds, while others are seedless. The navel orange is so called because of a remarkable development of adventitious cells which at the apex of the orange give the fruit an umbilical mark. The orange is a native of India or Southern China, whence it has been distributed by successive stages to all parts of the subtropical world and the warmer temperate regions. It was introduced into Florida and South America by the early Spanish explorers, and now flourishes wild there in many localities. It is cultivated in nearly all the countries bordering on the Mediterranean Sea, and in Portugal, India and Southern Asia, Japan, East Indies, Brazil, Jamaica, Florida, Louisiana, California, Australia, etc. In the United States the production of oranges has declined somewhat since 1896, owing to the severe winter freezes of 1894-95 and again in 1899, which ruined many of the orange groves of Florida. The twelfth census estimates the number of orange trees in the United States in 1899 at 8,397,710, and the production that year at 6,171,259 boxes. California, with 5,648,714 trees, produced 5,882,193 boxes; while Florida, with 2,552,542 trees, produced but 273,295 boxes.

Oranges are usually propagated from seed. Some varieties come true or nearly true to seed, but most do not, and so are propagated by budding. They thrive on nearly all kinds of fertile soils and are found in high, dry situations as well as low, alluvial lands subject to occasional overflow. They cannot be grown in situations subject to severe frosts during the growing season. The trees are set in the orchard when about two years from the bud, the distance apart usually favored in California being 10 feet for dwarfs, 18 to 24 feet for semi-dwarfs, 24 to 30 feet for standards, and 30 to 40 feet for seedlings. Clean, thorough cultivation is practiced during the growing season and irrigation given wherever necessary. Nearly all California orchards are irrigated. Orange trees under favorable conditions continue in bearing to a great age. Blossoms and green and ripe fruit are frequently seen on the trees at the same time, but the bulk of the crop ripens at about the same time. In harvesting the fruit is usually gathered by hand, being cut off and placed in sacks or cloth-lined baskets. It is kept for a few days in baskets or shallow bins in the packing house for the skins to dry and soften a little, then graded, each fruit wrapped in tissue paper, and packed for market in boxes holding two cubic feet each. Boxes hold from 96 to 252 oranges, according to the size of the fruit. Average sized fruit runs from 176 to 200 to the box. Oranges stand shipment well and when properly handled sometimes keep for months.

Orange Diseases. The orange, in common with many of the other citrus fruits, is subject to a number of injurious diseases by which the trees are destroyed or stunted in their growth and the fruit injured or rendered unsightly. One of the widest spread diseases, especially destructive of lemons and sweet oranges, is the 'foot-rot,' which is of unknown origin, but occurs in Florida, California, Europe, and Australia, and, according to estimates, has caused annual losses of more than $100,000 in Florida alone. It may be recognized by copious exudation of gum near the base of the tree, sparse, small yellow leaves, and dead small branches, and patches of dry bark which fall off. Other centres appear and the disease spreads until the whole tree is girdled. Removing the soil from around the crown of the tree seems to be the most effective treatment. Over cultivation is to be avoided and good drainage secured. 'Die-back,' so named from the dying of the young twigs for several inches from their tips, is a serious trouble in Florida. No variety or age of tree appears exempt from this disease, which seems to be due to malnutrition, resulting in part at least from improper cultivation and improper drainage. The fruit on trees is not abundant, ripens prematurely, and frequently splits, dropping from the tree before ripening. Withholding nitrogenous fertilizers, stopping cultivation, mulching about trees and thorough drainage have given good results in overcoming this disease. The sooty mold (*Meliola camelliæ*) is a fungus that follows scale and other insects which exude honeydew upon the trees. It covers the leaves and stems, interfering with their functions, and renders the fruit unsalable by the covering of black, almost felt-like mycelium. By destroying the insects with resin washes or by fumigation, the excretion of honeydew (q.v.) is stopped and the sooty mold disappears. Not only citrus trees, but many others are subject to this pest. 'Blight,' a destructive and apparently contagious disease of unknown cause, for which no cure is as yet known, seems to attack bearing trees only. The leaves suddenly wilt, even in rainy weather; numerous sprouts appear upon the trunk, and die after a season or two. The trees blossom profusely the season following the wilting, but are usually leafless, and set few fruits and ripen fewer. A single branch, or the whole tree, may be affected, but in any case the tree is finally destroyed. The scab is due to a species of Cladosporium which causes warts or scabs on the leaves and fruits, especially of lemons. Thorough spraying with ammoniacal copper carbonate will prevent this disease. At least five applications should be given. See Colored Plate of Citrus Fruits.

Consult: Bonavia, *Cultivated Oranges and Lemons of India* (London, 1890); Risso and Porteau, *Histoire naturelle des orangers* (Paris, 1822); *Culture of the Citrus*, in California State Board of Horticulture Report (Sacramento, 1902); Mills, *Citrus Fruit Culture*, California Agricultural Experiment Station, Bulletin 138; Harcourt, *Florida Fruits* (Louisville, Ky., 1886); Wickson, *California Fruits* (San Francisco, 1891); B. Aliño, *El naranjo* (Valencia, 1900); *Treatise and Handbook of Orange Culture in Florida, Louisiana, and California* (4th ed., New York and Jacksonville, 1892).

ORANGE, Prince of. See William I., the Silent; William III., King of England.

ORANGE-TREE SEEDLINGS, RIVERSIDE, CALIFORNIA

OR'ANGEBURG. A city and the county-seat of Orangeburg County, S. C., 51 miles south by east of Columbia; on the north fork of the Edisto River, and on the Southern and the Atlantic Coast Line railroads (Map: South Carolina, D 3). It is the seat of Claflin University (Methodist Episcopal) for negroes, opened in 1869, and of the Colored Normal, Industrial, Agricultural and Mechanical College. There are cotton and cottonseed oil mills, lumber mills, a furniture factory, machine shops, brick yards, etc. Orangeburg has a considerable trade in cotton, lumber, and turpentine. The water-works and electric light plant are owned by the municipality. Population, in 1890, 2964; in 1900, 4455.

ORANGE CITY. A town and the county-seat of Sioux County, Iowa, 45 miles north-northeast of Sioux City; on the Chicago and Northwestern Railroad (Map: Iowa, A 2). It has the Northwestern Classical Academy, with the Rapelye Library of 3000 volumes, and is interested principally in farming and stock-raising. The new court house here is a handsome structure. Population, in 1890, 1246; in 1900, 1457.

ORANGE FREE STATE. See ORANGE RIVER COLONY.

ORANGE INSECTS. The insects which affect the orange, also, as a rule, affect the lemon and other trees of the genus Citrus. The most important and injurious are the scale insects of the family Coccidæ, which attack the leaves, twigs, branches, and trunk. The long scale (*Mytilaspis Gloveri*) and the purple scale (*Mytilaspis citricola*) were for a long time the principal insect enemies of the orange groves in Florida, but the Florida red scale (*Aspidiotus ficus*) and the chaff scale (*Parlatoria pergandei*) have become numerous and injurious. In Louisiana the chaff scale has been the principal enemy, although the purple scale has done some damage. The orange chionaspis (*Chionaspis citri*) also occurs abundantly in this State as well as in Mexico and the West Indies. In California none of these species are noted as pests in the orange groves, although the purple scale and the long scale have been accidentally introduced into some localities during the past few years. The principal California scales are the California red scale (*Aspidiotus citricola*), the white or fluted scale (*Icerya Purchasi*), and the black scale (*Lecanium olea*). The white or fluted scale has been practically exterminated by the introduction of the Australian ladybird (*Vorius cardinalis*—*see* LADYBIRD), and the black scale is more of a pest to the olive orchards than to the orange groves. The California red scale is therefore the only serious scale insect enemy to the citrus trees of California, and is kept in check by fumigation with hydrocyanic acid gas, and by spraying with the kerosene distillate emulsion. The soft scale (*Lecanium hesperidum*), the hemispherical scale (*Lecanium hemisphæricum*), the Florida wax scale (*Ceroplastes Floridensis*), and the barnacle scale (*Ceroplastes cerripediformis*), as well as the common mealy-bug (*Dactylopius citri*), are also found in orange groves, but seldom do any great damage. *See* SCALE INSECT.

A rather serious pest in Florida, and to a lesser extent in Louisiana, is the white fly (*Aleurodes citri*) which sometimes swarms upon the leaves of citrus fruits, stopping the pores and extracting the sap, and which through its saccharine excretion is also the nidus for the spores of a black smut-fungus which further damages both the health and appearance of the trees and fruit. A mite enemy of the orange injures the fruit to some extent, and is especially harmful to the salable value of the fruit. This is *Phytoptus oleivorus*, called the 'rust mite' of the orange and the 'silver mite' of the lemon, since it produces a rusty appearance on orange fruit and a silvery appearance on lemons. The sovereign remedy against these mites is flowers of sulphur added to kerosene emulsion spray. Another mite which occurs upon oranges, and which is closely allied to the so-called 'red spider' of greenhouses, is the six-spotted mite (*Tetranychus sexmaculatus*). It feeds mainly on the under sides of the leaves, and it is also readily controlled by the use of sulphur in some form or another. (See MITE.) Some damage is occasionally done to orange trees by termites or so-called white ants, but usually because of some prior damage.

The leaves are injured by the orange aphis (*Siphonophora citrifolii*), and by several sucking bugs, such as the green soldier bug (*Nezara hilaris*) and the thick-thighed metapode (*Metapodius femoratus*). A number of caterpillars feed upon the leaves, the most conspicuous of which is the larva of *Papilio cresphontes*, sometimes known as the 'orange dog.' The saddle-back caterpillar (larva of *Empretia stimulea*), and the bagworm (larva of *Oiketicus Abbotii*), and several other less prominent lepidopterous larvæ eat the leaves to a greater or lesser extent, and there are several leaf-rollers which also damage the foliage. The cotton-stainer (q.v.) or red-bug (*Dysdercus saturellus*) punctures the fruit; as does also the leaf-footed bug *Leptoglossus phyllopus*). A very serious enemy of the orange in Mexico, and one the advent of which is greatly feared by the orange-growers of the United States, is the Morelos orange worm or fruit-fly, the larva of *Trypeta ludens*. Here the fly lays her eggs upon the skin of the young orange, and the maggots which hatch from these eggs penetrate the pulp and ruin the fruit. Nearly all of the species just mentioned occur in Mexico and the West Indies, and several of them are found in the orange groves in Mediterranean regions. In South Africa and Australia the orange has a different insect fauna, but the species are allied to those in America and represent practically the same groups.

Consult: Hubbard, *Insects of the Orange*, Department of Agriculture, Washington, 1886; Marlatt, "The Scale Insect and Mite Enemies of Citrus Trees," in *Yearbook, Department of Agriculture for 1900* (Washington, 1901).

ORANGEMEN. The members of the Irish society called 'The Loyal Orange Institution.' After the battle of the Boyne (q.v.) in 1690, the Irish Catholics, who on account of their Jacobite leanings were oppressed by the English, began to form various semi-revolutionary societies. In opposition, the Irish Protestants formed the above-named society, the object of which was to oppose Roman Catholicism and to maintain the union of England and Ireland and the Protestant succession to the crown. Though it derived its name from William III. (of Orange), who drove out the Catholic James II., it was first definitely established in Ulster in 1795. It extended rapidly, and even had some lodges in England and Canada. Parliament was compelled

to check the turbulence of the organization on several occasions, and from 1813 to 1828 it was suspended in Ireland. It had a complex organization, and the grand lodge had a meeting twice a year, in May and on November 5. In Ireland the society has for a long time had no influence, but there are numerous lodges still existing in the United States. July 12th, the anniversary of the battle of the Boyne, is 'Orange Day.' Consult: *View of the Present State of Ireland and of the Disturbances in That Country* (London, 1797); "An Unbiased Irishman," *Orangeism Exposed* (New York, 1824); *Parliamentary Report on the Orange Association* (London, 1835); Lilburn, *Orangeism: Its Origin, Constitution, and Objects* (ib., 1866); Lecky, *History of England in the Eighteenth Century*, vols. vii., viii. (ib., 1878-90).

ORANGE-NASSAU, Order of. A royal order of the Netherlands, with five classes, founded in 1892 in the name of Queen Wilhelmina. It is conferred as a reward for services to the country or to the royal house, and may be given to foreigners as well as natives. The decoration, a blue enameled cross with eight points, surrounded by a laurel wreath, bears the national arms on a blue ground with the legend, *Je maintiendrai*, on the reverse a W with the inscription *God zij met ons* ('God be with us').

ORANGE OIL. An essential oil obtained from the rind of the orange. *Essence de Bigarade*, from the bitter orange, is distinguished from *essence de Portugal*, from the rind of the sweet orange. The oil is extracted sometimes by distillation, but more commonly by the sponge process, which consists in pressing the peel of the fruit forcibly against a piece of flat sponge in such a manner as to break the cells, from which the oil exudes and is absorbed by the sponge. When exhausted the peel is thrown aside and the sponge wrung out into a bowl, where the oil separates from the watery liquid which accompanies it, and is then decanted. This oil, which is a pale yellowish liquid, consists of nearly 98 per cent. of a terpene called lemonene, and is used for flavoring and in perfumery. The essential oil obtained by the aqueous distillation of the fresh flowers of the bitter orange is chiefly used in perfumery under the name of oil of orange flowers, or oil of neroli. The yield from one ton of flowers is about forty ounces, and the finest trees afford about sixty-six pounds of flowers. The neroli oil is a yellowish or brownish liquid with an odor of orange flowers and a bitter aromatic flavor. Both orange oil and oil of neroli are made chiefly in the south of France.

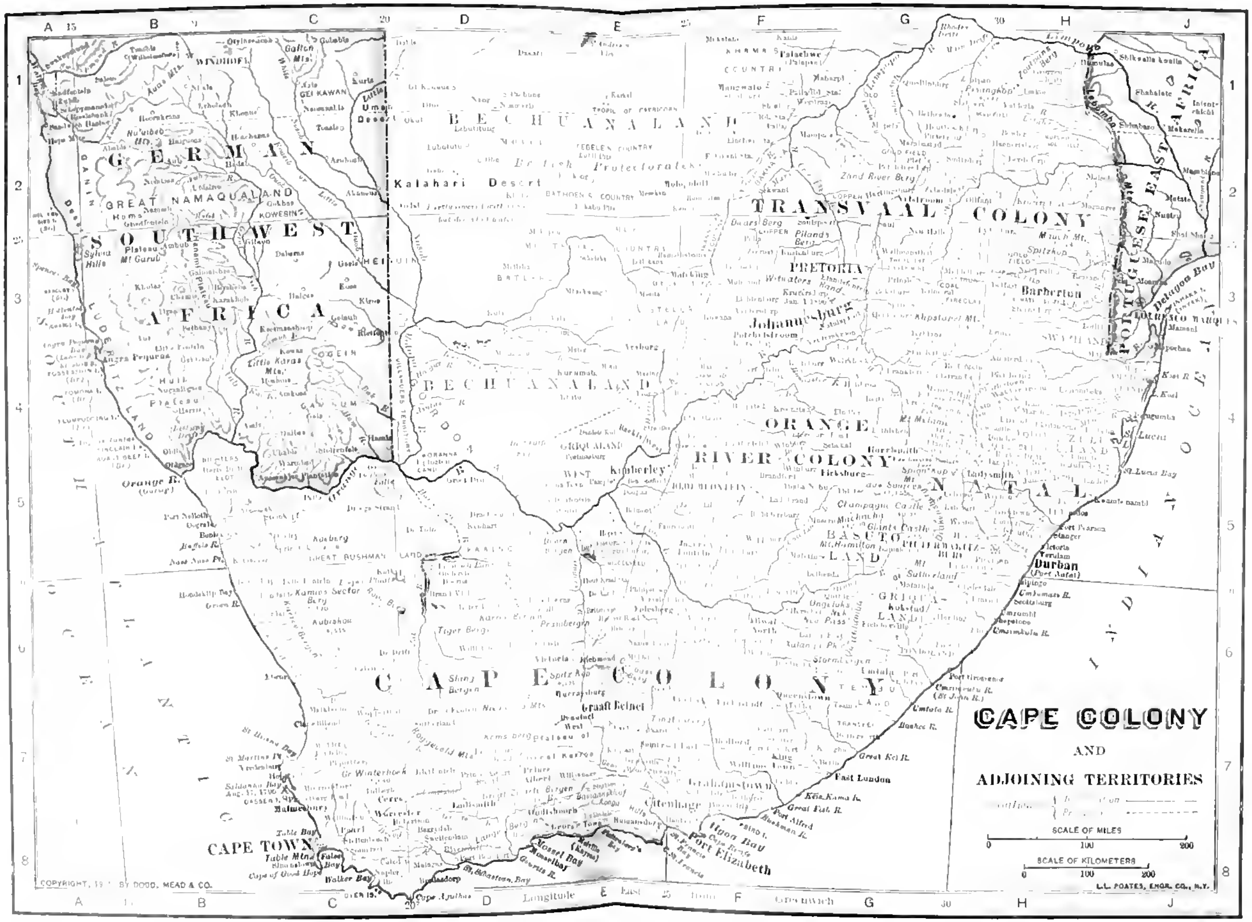
ORANGE RIVER (Hottentot *Gariep*, Great Water). The principal river of the extreme southern part of Africa (Map: Africa, F 7). Its farthest headstream rises on the slope of Champagne Castle, a peak of the Drakenberg on the boundary between Natal and Basutoland, scarcely more than 100 miles from the Indian Ocean. It flows across the continent in a general westward course, first southwestward through Basutoland, then forming in a large bend the southern boundary of the Orange River Colony, after which it flows across the northern part of Cape Colony, and finally forms the boundary between the latter and German Southwest Africa until it empties into the Atlantic Ocean. Its total length is nearly 1300 miles. It receives in the upper two-fifths of its course practically all its permanent tributaries, the last and largest of which is the Vaal (q.v.), which is by some geographers considered as the true upper course of the river. Below its confluence with the Vaal the Orange flows through the arid wilderness of the southern Kalahari region and Namaqualand. In the last 500 miles of its course it receives no permanent tributaries, though several large wadis lead into it. Its volume decreases by evaporation, and at its mouth it is almost exhausted. A sand bar blocks the mouth. In the wet season the river becomes an impetuous torrent. About 20 miles from its mouth it is completely obstructed by rapids, and farther inland, above its confluence with the Molopo Wadi, it forms the famous 'Hundred Falls' or the Great Aughrabies. Here the river descends 400 feet in a course of 16 miles in a continuous series of rapids and cataracts between a confusion of high rocky crags. The river received its present name in 1777 in honor of the House of Orange. Consult Chavanne, *Afrikas Ströme und Flüsse* (Vienna, 1883).

ORANGE RIVER COLONY (formerly the Orange Free State). A British colony in South Africa, lying between the Orange River and its tributary the Vaal (see accompanying map). The latter separates the colony from the Transvaal Colony on the north, and the former from Cape Colony on the south. Cape Colony (Griqua Land West) also forms the western boundary, while on the east the colony is bounded by Natal and Basutoland. The area is estimated at 48,226 square miles.

Physical Features. The surface is an undulating plateau lying at an elevation of 3000 to 4000 feet above the sea. This plateau is bounded on the east by the Drakenberg, with a height of 7000 to 11,000 feet, and slopes mainly westward and northwestward toward the Vaal River. It is for the greater part a prairie country, affording good pasturage in summer, but very sparsely wooded except in the eastern mountains and along the rivers, which are fringed with willows. The colony is watered entirely by the tributaries of the Orange and the Vaal. The climate, owing to the high altitude and the dryness of the air, is very healthful and agreeable. The region is, however, subject to hot winds from the interior, so that the temperature rises actually higher than in the lower ground of Natal. The mean temperature is about 61°, and the average extremes are: highest 95°, in January; lowest 40°, in June. The dominant flora is herbaceous, becoming shrubby toward the west. The large wild animals have entirely disappeared. The country suffers occasionally from the locust plague.

The northeastern portions of the country consist mainly of Triassic sandstones and shales interbedded with horizontal coal seams which outcrop especially in the Kroonstad and Heilbron districts in the extreme north. The southwestern portion belongs to the great South African lacustrine basin, the surface rock being of the Karoo series with intrusions of igneous rocks.

Mining. The mining industry of the colony is confined principally to the production of diamonds, which are found at Koffyfontein and Jagersfontein, in the Fauresmith district. They are also found to some extent in the neighborhood of Kroonstad, in the north. During the last decade of the nineteenth century considerable prog-


CAPE COLONY
AND
ADJOINING TERRITORIES
SCALE OF MILES
SCALE OF KILOMETERS
GERMAN SOUTHWEST AFRICA
GREAT NAMAQUALAND
BECHUANALAND
Kalahari Desert
TRANSVAAL COLONY
PRETORIA
Johannesburg
Barberton
ORANGE RIVER COLONY
Kimberley
BASUTO LAND
NATAL
Durban
ZULULAND
CAPE COLONY
Graaff Reinet
Grahamstown
East London
Port Elizabeth
CAPE TOWN
Table Bay
Walker Bay
Mossel Bay
Delagoa Bay
Orange R.
Longitude East from Greenwich
L.L. POATES, ENGR. CO., N.Y.

ress was made in the exploitation of the diamond fields, the output having increased from 99,225 carats, valued at £224,000, in 1890, to 307,000 carats, valued at £1,508,000, in 1898. The large coal deposits in the north around Kroomstad are extensively exploited. Gold is also found.

AGRICULTURE. By the conformation of the surface the soil is better adapted for grazing than agriculture, and, although grain-raising is on the increase, it is still inferior to the pastoral industry. There are at present about 10,000 holdings, comprising about 30,000,000 acres, of which a very small part is under cultivation.

COMMERCE AND TRANSPORTATION. The principal exports of the colony are wool, hides, corn, and diamonds. The commerce was almost entirely suspended by the Boer War, exports falling off from about £2,000,000 in 1898 to about £23,000 in 1901. The imports, consisting mostly of general merchandise, were less affected. The colony has about 400 miles of railways, the main line entering from Cape Colony and connecting Bloemfontein with the Cape and the Transvaal railway systems. There is also another line connecting the northeastern part of the colony with the Natal system. The railways were originally constructed by Cape Colony and acquired by the Orange Free State in 1897.

GOVERNMENT. Since the establishment of civil government after the annexation of the colony to Great Britain, the Orange River Colony has been under the supreme authority of the Governor of Orange River and the Transvaal colonies, who is represented in the former colony by a Lieutenant-Governor, assisted by an executive council. The revenue is derived principally from customs. The revenue and expenditure for 1902-03 were estimated at £775,000 and £760,000 respectively.

There is a system of Government schools, but education is neither compulsory nor free. The population of the colony in 1890 was 207,503, of whom 77,716 were white and 129,787 natives. The majority of the white inhabitants belong to the Dutch Reformed Church. Capital, Bloemfontein (q.v.).

HISTORY. Before 1836 the region between the Vaal and Orange rivers was a wilderness, inhabited by wandering bands of Bushmen and broken tribes of refugees from the armies of the great Zulu rulers, Chaka, Dingaan, and Maselikatse. In 1836 there was a great emigration of Boers from Cape Colony, owing to dissatisfaction with the British Government. This movement, the 'Great Trek,' had Natal for its goal, but, the British not allowing the Boers to remain in possession of this region, a part of them settled in the country north of the Orange and another in the territory north of the Vaal. The republic thus established between the Orange and Vaal (1842) proved a disturbing neighbor to Cape Colony, so that after some friction it was forcibly annexed by the British in 1848. The country continued in their possession until 1854, when it was formally given up. The independence of the Orange Free State was declared on February 23d and a constitution adopted on April 10th, which was revised February 9, 1866, May 8, 1879, and May 11, 1898. About the year 1862 a large number of Griquas (q.v.) sold their farms to the Free State Government, and migrated in a body to the coast side of the mountains in independent Kaffraria, occupying a large tract of country there known by the name of No Man's Land. In 1866 a treaty was concluded with Moshesh, chief of the Basutos, by which a portion of the territory known as Basuto Land was ceded to the Orange Free State. The boundaries agreed on by this treaty were, however, somewhat modified by the Governor of Cape Colony in 1869. The intimate relationship of the Orange Free State and the South African Republic established a community of interests between them whenever local jealousies were put aside, and a party in each State always desired their union, or at least a close alliance. When in 1899 the jealousy between the Boers and the Uitlanders, or foreign settlers in the two republics, together with the pugnacious diplomacy of President Kruger of the South African Republic and Joseph Chamberlain, the British Colonial Secretary, brought on war between the countries they represented, the Orange Free State cast its lot with its sister republic. This was in accordance with a treaty, arranged in April, 1897, for mutual support in case of attacks upon the independence of either. After the first aggressive campaigns of the Boers, the Orange Free State was overrun by the tide of British success; and on May 24, 1900, Field-Marshal Lord Roberts, commanding the British forces, issued at Bloemfontein, the capital, a proclamation annexing the Orange Free State to the British Empire as the Orange River Colony. The Orange Free State witnessed much of the guerrilla fighting after the formal annexation of the Boer republics; it was repeatedly traversed by British columns in 1900-1902, and its President, Steyn, was one of the last to submit to the British. See TRANSVAAL; SOUTH AFRICA; SOUTH AFRICAN WAR.

BIBLIOGRAPHY. Johnson, *Africa* (London, 1884); Keane, *South Africa*, vol. ii. (ib., 1895); Theal, *South Africa* (ib., 1899); Norris-Newman, *With the Boers in the Transvaal and Orange Free State in 1880-81* (ib., 1882); Struben, *Notes on the Geological Formation of South Africa and Its Mineral Resources* (ib., 1897); Bryce, *Impressions of South Africa* (ib., 1897); Norris, *The South African War* (ib., 1900); Wright, *Thirty Years in South Africa* (ib., 1900); Crosswicke, *South Africa and the Transvaal War* (Edinburgh, 1900); Keane, *The Boer States, Land and People* (London, 1900); De Wet, *Der Kampf zwischen Bur und Brite* (Leipzig, 1902); id., *Im Kampf um Südafrika* (Munich, 1902 et seq.); Robinson, *A Lifetime in South Africa* (London, 1900).

ORANGE ROCKFISH. See ROCKFISH.

ORANGE ROOT. See HYDRASTIS.

ORANGE-TIP. Any one of several butterflies of the family Pieridæ, which are usually white in color marked with black, and have a conspicuous orange spot at the end of the front wings, the lower surface of the hind wings being mottled with a greenish network. The most noted species in the United States is *Anthocharis genutia*. It is found throughout the Southeastern United States, reaching as far north as Connecticut.

ORANG'-UTAN' (Malay, man-of-the-woods). One of the three great anthropoid apes (*Simia satyrus*). It inhabits Borneo and Sumatra, and differs in several important respects from its African relatives, the chimpanzee and gorilla (qq.v.). Its individual features are the height

of the skull, the long arms, nine bones in the wrist and sixteen dorso-lumbar vertebræ, of which twelve bear ribs. In external appearance the orang is not so human as the gorilla, the reddish-brown hair with which the body is clothed, the long arms, with a very short thumb,

TEETH OF ORANG-UTAN.

and the long slender hands and feet, combining to emphasize the resemblance to monkeys. The head is more anthropoid, as the skull lacks the prominent superciliary ridges of the gorilla and is strikingly brachycephalic; moreover, the openings of the nostrils are more pear-shaped than in the other apes. The brain is noticeably like that of man, more so than that of either the gorilla or chimpanzee, as the cerebral hemispheres are much convoluted. The teeth, however, are more ape-like than human, for the canines, especially of the male, are strongly developed. The formation of the larynx is extraordinary, as there is a large sac, developed from its united ventricles, which hangs down in front of the trachea. The thumb and big toe are very small and often lack nails, and sometimes even the terminal phalange is missing. The body is bulky and the legs are short and comparatively weak, but the arms are so long that they reach to the ankles when the animal is erect, and are exceedingly muscular. In walking the weight is born on the knuckles of the hands and the outer sides of the feet, so that neither the palms nor the soles are placed squarely on the ground. Only when assisted by some artificial support do these apes walk on the feet alone. In height the orang is about 50 inches or less, the males being much the larger.

These apes are now inhabitants of the swampy forests of Borneo and Sumatra alone, but there is reason to believe that species of this genus formerly inhabited the southeastern portion of the Asiatic continent. They have few natural enemies, of which large serpents and crocodiles are the most important, but even for these the orangs have little fear, nor are they alarmed at the appearance of man. They are arboreal in their habits and rather deliberate in their movements, but are agile and very much at home in trees. They build nests or platforms of branches at a height of 30 or 40 feet from the ground, and there they are said to sleep, being diurnal in habit. The female also brings forth her single young one in such a home, which it is said the male builds for her. Wounded orangs build such shelters for themselves, when escape by flight is impossible. These apes are purely vegetarian in diet, living chiefly on fruit and young, tender shoots, and they rarely have occasion to go to the ground for food. Sometimes, however, they go in search of water and are thus obliged to travel on the earth. They ordinarily go on all fours, but may raise themselves on their feet, and, by grasping overhanging branches with their hands, progress rapidly in an erect position. In traveling in this way or from tree to tree, they make as much as five or six miles an hour. They are not gregarious, but are usually found single or in pairs. Though naturally peaceable, they can make a fierce resistance when cornered and compelled to defend themselves. When taken young, they can be readily tamed, and are frequently seen in zoölogical gardens.

Consult: Hartman, *Anthropoid Apes* (New York 1886); Wallace, *Malay Archipelago* (New York, 1869); Hornaday, *Two Years in the Jungle* (New York, 1885); Forbes, *Monkeys*, in Allen's "Naturalist's Series" (London, 1894); Haeckel, *Aus Insulinde* (Bonn, 1901). See Plate of ANTHROPOID APES, with APE.

ORANIENBAUM, ô-rä'nê-en-boum. A town in the Government of Saint Petersburg, Russia, 19 miles west of that city, on the Gulf of Finland, opposite Kronstadt (Map: Russia, B 6). It has a fine palace, built by Mentchikoff, now belonging to the Grand Duke of Mecklenburg-Strelitz, a summer theatre, many fine villas, a marine hospital, and other benevolent institutions. Its proximity to Saint Petersburg and its sea-bathing facilities make it a popular summer resort. The place was originally the private estate of Prince Mentchikoff, and the palace was for some time occupied by Peter III. Population, in 1897, 5300.

ORÁONS, ô-rä'ônz. Inhabitants of the west and northwest of Orissa and Chota Nagpur, in India, one of the groups of tribes speaking Dravidian languages. They are still a very primitive people. Their dances and marriage customs are of considerable interest. The young people have great freedom in their choice of wives and husbands. The Oráons, or Uráons, call themselves Kurukh; and are also known as Dhangar ('mountaineers'). Consult: Batsch, "Notes on the Oráon Language," in the *Journal of the Royal Asiatic Society of Bengal* for 1866; Dalton, *Descriptive Ethnology of Bengal* (Calcutta, 1873); Rowney, *The Wild Tribes of India* (London, 1882).

OR'ATO'RIO (Ital., oratory). A form of sacred music chiefly epic in character, consisting of choruses and soli accompanied by the orchestra, and generally preceded by an instrumental overture. The name is derived from the oratory of churches, where the first performances took place. The full title of such a work was *Rappresentazione per il oratorio*. Gradually the name of the place came to be used for the art-form itself. The originator of the oratorio is Philip Neri (q.v.), who, soon after his ordination to the priesthood (1551), began a series of public lectures on Bible history. In order to make his talks more interesting, Neri engaged the services of Animuccia, the master of the Papal chapel, who composed so-called *Laudi Spirituali* (hymns) for these lectures. The success of this undertaking was pronounced. After the death of Animuccia no less a master than Palestrina furnished the music. At the beginning these *Laudi* had but a loose connection with the subject matter of the lecture, but they soon grew into a kind of mystery with moralizing tendencies. The characters generally were personifications of abstract ideas. The first work of this kind was Cavalieri's *Anima e corpo* (1600), in which the composer makes use of the new kind of recita-

tive that had just then been originated by the founders of the Florentine musical drama (*stilo rappresentativo*). These first oratorios were called *Azioni sacri*, and differed in nothing from operas except in choice of the subjects. Even the ballet is introduced. Carissimi (1604-74) banished scenery and acting from these performances. But to compensate he introduced the character of the *historicus* (later called *narrator*), a person who sang the narrative portions of the text. Alessandro Scarlatti (1659-1725) introduced the aria into the oratorio, thus relieving the monotony of the purely declamatory style of his predecessors. For the passages assigned to the narrator he wrote *Recitativo secco*. Along these lines followed Caldara, Leo, and Stradella.

In Germany the oratorio also developed from the mysteries. The earliest work of this kind is Stephani's *Passio secundum Matthæum* (1570), but it remained the only one for some time. Not until 1623 do we meet another oratorio, Schütz's *Die Auferstehung Christi*. Whereas the Italian composers favored the new monodic style, Schütz clung to the polyphonic manner to such an extent that the words of a single personage, the Evangelist, were set to a chorus with elaborate accompaniment. His second oratorio was *Die sieben Worte Christi*. The subject matter of these oratorios indicated the direction in which that form was to develop in Germany, for all succeeding composers limited themselves to the story of the Passion of Christ. Thus the oratorio became the *passion oratorio*, or briefly the *passion*. In 1704 two oratorios appeared in Hamburg, one by Keiser, the other by Handel, which attracted the attention of other composers, especially Mattheson (1681-1764) and Telemann (1681-1767). These works placed the oratorio upon a higher level than it had attained in Italy. The German masters, while not repudiating the monodic style, worked in the polyphonic style and won great popularity for the new art-form by the frequent use of the chorale (q.v.). They even employed phrases of chorales as subjects for the fugues. The way was now prepared for Bach (1685-1750), in whose *Passion According to Saint Matthew* the form found its loftiest expression (1729). Into some of the choruses a contemplative element is introduced, consisting of meditations upon the events just narrated. After Bach only one other composer, Graun (1701-59), wrote a passion that has not fallen into oblivion. This was *Der Tod Jesu* (1755).

In Hamburg Handel had written a German passion. Four years later, in Italy, he wrote two oratorios: *Il trionfo del tempo e del disinganno*, an allegorical work entirely after the manner of Carissimi; and *La Resurrezione*, a real Italian oratorio like those of Scarlatti. In 1716 he wrote one other German passion. All these works were only a preparation for his great English oratorios, upon which the fame of Handel (1685-1759) rests, and which to this day mark the perfection of this art-form. When the master wrote his first English oratorio, *Esther* (1720), he had completely formed his style. The excellent choruses which were at his disposal in London led him to assign the chief portions of the oratorio to the chorus. And it is just in these numbers that Handel's genius shines most. In the masterly treatment of vocal fugues Handel stands without a rival, as does Bach in his mastery over the instrumental fugue. The chorus is used for various purposes; sometimes it is contemplative, as in Bach's passion, at other times didactic, teaching a moral lesson; then again he uses it in a dramatic manner to mark a climax, and again at times for descriptive or narrative purposes. In the matter of the aria-forms Handel does not hesitate to employ all the various kinds in common use then in the opera, even the bravura-aria. The recitative is generally the dramatic recitative; the *recitativo secco* is practically banished, for it appears only in very short numbers, and even then with changing harmonies. His subjects Handel chose from the whole range of biblical history, a proceeding that has been followed by all subsequent composers of oratorios.

At the same time that Handel perfected the oratorio in England this art-form rapidly deteriorated in Germany. The baneful influence of the decadent opera affected all forms of sacred music. The oratorio, like the opera, soon consisted of a number of arias or duets, loosely strung together, and served no other purpose than the exhibition of bravura singing. There was practically no difference between the music of an oratorio and an opera. The works of this period have, therefore, very aptly been called 'concert oratorios.' What has just been said regarding the oratorio in Germany applies with equal force to that form in Italy. The oratorio had entirely lost its distinctive traits and assimilated those of the opera. It is not at all surprising, then, that when the reforms of Gluck brought about a change in operatic music, some change at once became noticeable in the oratorios. But even the best works of that time have not attracted more than passing attention. The first master since Handel who has written oratorios of sterling merit is Haydn (1732-1809) (*The Creation*, *The Seasons*). But Haydn's style is radically different from Handel's; while the latter's might be characterized as epic, the former's is rather lyric and descriptive. Even the instrumental introductions show the difference between the two masters. Those of Handel are fugal and belong entirely to the polyphonic-contrapuntal style, those of Haydn are descriptive and belong to the homophonic harmonic style. In Haydn's works the orchestra is a far more important factor than in Handel's. Strictly speaking, only the *Creation* is an oratorio; the *Seasons* is entirely secular in character and really a charming idyl in oratorio-form. Spohr (1784-1859) chooses loftier subjects and treats them in an individual manner, although he does not depart from established forms, while the sixteen oratorios of his contemporary, Schneider (1786-1853), who enjoyed great popularity during his life-time, were soon forgotten. The next great master in the history of the oratorio is Mendelssohn (1809-47). His two oratorios, *Saint Paul* and *Elijah*, are undoubtedly the greatest works in this form since the days of Handel. On the whole, Mendelssohn follows the principles that guided Bach, for, like the great Leipzig cantor, he insists upon the chorale. The overture to *Saint Paul* begins with an instrumental setting of one of the most famous chorales; then follows some fugal writing in which motives from the chorale are skillfully interwoven. The fugal writing in many choruses is more in the manner of Handel. But although

Mendelssohn adopted general art principles from his great predecessors, his music preserves throughout its own individuality, so that nothing could be further from the truth than to regard Mendelssohn as an imitator of either Bach or Handel. Liszt (1811-86) also tried his talents in the oratorio (*Christus, Saint Stanislas, Saint Elisabeth*), but these works do not mark any distinct phase in the development of the art-form. Rubinstein (1829-94), when he found that he was unable to compete with his formidable rival Wagner in the field of dramatic composition, turned his attention to the oratorio. His determined efforts to be original led him to make several attempts to revive scenic representations of the oratorio under the name of *sacred opera* (Geistliche Oper). His works in this form, *Paradise Lost, The Tower of Babel, Moses*, met only with a *succès d'estime*. Not even the idea of sacred opera is original with Rubinstein, for, as we have seen, up to the time of Carissimi oratorios were practically sacred operas. But even much later biblical subjects had been introduced upon the operatic stage, as *Joseph*, by Méhul, and *Mosè in Egitto*, by Rossini.

In France the form of the oratorio never found much favor. Not only have French composers not added to the repertoire of oratorios, but the performances of such works by Handel and other composers are very rare. The first biblical oratorios written in France are those of Lesueur (1763-1837). All of these are very short and were never performed outside of France. The first French oratorio that was heard outside of its native land was *L'enfance du Christ*, by Berlioz (1854). It only enjoyed a short popularity when after 1870 the Berlioz cult was at its height. Gounod's *Redemption* (1882) and *Mors et Vita* (1885) are probably the most important of the French oratorios, and they have both been given outside of France. The sacred works for the stage written by Saint-Saëns (1835—), *Samson et Dalilah* and *Déluge*, are constantly performed, both as operas and, without scenic accessories, as oratorios. The elaborate choruses are certainly in true oratorio style. Massenet's *Ève* (1875) and *La Vierge* (1880) and the four-act sacred drama *Marie-Madeleine* (1873) continue the tradition of the French school of oratorio.

Among modern oratorios the *Franciscus* (1888) of Tinel and the *Saint Ludmilla* (1886) of Dvořák have attracted considerable attention, while *The Dream of Gerontius* (1900), by Elgar, a young English composer, has been accepted by many writers as the finest specimen of English oratorio since the days of Handel. Quite recently (1897) a young Italian composer, Perosi (1872—), has come forward with a most ambitious work, an oratorio-trilogy, the three parts of which bear the titles: *Passion according to Saint Mare, The Transfiguration of Christ, The Resurrection of Lazarus*. The composer evidently attempted nothing less than a combination of the art-styles of Palestrina, Bach, and Wagner. But if we except the oratorios of Mendelssohn it would seem that the nineteenth century has produced no oratorios that are likely to live long. This inability of composers to write successful biblical oratorios led to the establishment of a form that has been called *secular oratorio*. It is true Handel (*Heracles, Semele*) and Haydn (*Seasons*) wrote such works, but these appear to be rather isolated instances, and besides attempt to preserve some connection with the real oratorio by occasional religious choruses. Schumann may be regarded as the founder of the 'secular oratorio.' His *Das Paradies und die Peri* (1843) was the first work in which the form of the oratorio was employed for a purely secular work. To this class belong also Schumann's *Faust* (1853) and *Der Rose Pilgerfahrt* (1851). Next to Schumann the greatest master of the secular oratorio is Bruch, whose *Odysseus* (1873) and *Achilleus* (1885) are frequently performed by the larger choral societies of Germany and England. Of other composers of this form the following are deserving of mention: Gade (*Die Kreuzfahrer*), Vierling (*Der Raub der Sabinerinnen, Alarich*), Lorenz (*Otto der Grosse*), Goldschmidt (*Die sieben Todsünden*), and Benoit (*Die Schelde*). See MIRACLE PLAY; MORALITY; MYSTERY; OPERA; and consult: Patterson, *The Story of Oratorio* (New York, 1902); Kretzschmar, *Führer durch den Concertsaal* (Leipzig, 1895-99); Upton, *The Standard Oratorios* (Chicago, 1890).

LIST OF IMPORTANT ORATORIOS.

Armes, P.	Hezekiah (1878).
	St. John the Evangelist (1881).
Arne, Abe	Abel (1755).
	Judith (1764).
Arnold, S.	Abimelech (1768).
	Prodigal Son (1767).
Atterbury, L.	Goliath (1773).
Bach	Christmas Oratorio (1734).
	St. Matthew Passion (1729).
	St. John Passion (1720).
Barnby	Rebekah (1870).
Barnett, J. F.	The Raising of Lazarus (1876).
Beethoven	Christus am Oelberg (1799).
Benedict	St. Cecilia (1866).
	St. Peter (1870).
Bennett	The Woman of Samaria (1867).
Berlioz	L'Enfance du Christ (1854).
Brahms	The German Requiem (1868).
Carissimi, G. (c.1604-74.)	Jephte.
	Baltazar.
	Jonas.
Cavaliere	La Rappresentazione dell' Anima ed il Corpo (1600, first oratorio).
Cimarosa, D.	Il Sacrificio d'Abramo (1786).
	L'Olimpiade (1787).
Costa	Eli (1855).
	Naaman (1864).
Cowen, F. H.	The Deluge (1878).
	Ruth (1887).
Crotch	Palestine (1812).
	The Captivity of Judah (1834).
Cusins	Gideon (1871).
David, F. C.	Moïse au Sinai (1846).
Dvořák	St. Ludmilla (1886).
Elgar, E.	The Light of Life (1896).
	The Dream of Gerontius (1900).
Goldschmidt, O.	Ruth (1867).
Gounod	La Redemption (1882).
	Mors et Vita (1885).
Graun	Der Tod Jesu (1755).
Handel	Israel in Egypt (1738).
	Il Trionfo del Tempo (1707).
	Esther (1720).
	Saul (1738).
	The Messiah (1741).
	Samson (1742).
	Joseph (1743).
	Judas Maccabæus (1746).
	Occasional (1746).
	Theodora (1749).
Haydn	The Creation (1796-98).
	The Seasons (1800).
Hiller, F.	Die Zerstörung Jerusalems (1810).
	Saul (1858).
Horsley, C. E.	Gideon (1860).
	David.
	Joseph.
Jenkins, D.	The Legend of St. David (1894).
Kiel, F.	Christmas (1874).

Klein, B.	Jephthah (1828). David (1830). Hiob (1829).
Leslie, H. D.	Immanuel (1853). Judith (1858).
Liszt	Die Legende von der heiligen Elisabeth (1864). Christus (1866).
Loewe	Die Festzeiten (1829). Die Zerstörung Jerusalems (1829).
Loreto, V.	St. Ignatius Loyola (1622).
Macfarren	St. John the Baptist (1873).
Mackenzie	The Rose of Sharon (1884).
Marx, A. B.	Moses (1850).
Massenet	Marie-Madeleine (1873). Eve (1875). La Vierge (1880).
Mendelssohn	St. Paul (1836). Elijah (1838-46). Christus (1841-47).
Meyerbeer	Gott und die Natur (1811).
Molique, B.	Abraham (1860).
Neukomm	Mount Sinai (1839). David (1834).
Ouseley	The Martyrdom of St. Polycarp (1855). Hagar (1873).
Paine	St. Peter (1873).
Parry, C. H.	Judith (1888). Job (1892). King Saul (1894).
Parry, Jos.	Saul of Tarsus (1892). Emmanuel (1880).
Pergolesi	San Guglielmo d'Aquitania (1731).
Pierson	Jerusalem (1852).
Porpora (1686-c.1766.)	La Martiria di Santa Eugenia.
Rheinthalen	Jephta (1856).
Rossini	Stabat Mater (1832-41).
Rubinstein	Der Thurm zu Babel (1870). Das verlorene Paradies (1876). Moses (1887). Christus (1895).
Saint-Saëns	Noël (1858).
Scarlatti, A. (1659-1725.)	Dolori di Maria. Sacrifizio d'Abramo.
Schneider, F.	The Judgment of the World (1819). Paradise Lost (1824). Pharaoh (1828). Christ the Child (1829). Gethsemane and Golgotha (1838).
Schubert	Lazarus (1828).
Schumann	Paradise and the Peri (1843).
Schütz, H. (1585-1672.)	Resurrection. Passion.
Spohr	Last Judgment (1812). Calvary (1833). Fall of Babylon (1840).
Stainer, J.	St. Mary Magdalen (1883). The Crucifixion (1887).
Stanford	The Resurrection (1875). The Three Holy Children (1885).
Sullivan	The Prodigal Son (1869). The Light of the World (1873).
Verdi	Manzoni Requiem (1874).
Winter	Pilgrimage to Calvary (1792).
Zingarelli, N.	The Passion (1787). The Flight into Egypt (1837).

ORATORIO SOCIETY. See CHORAL SOCIETIES.

ORATORY (Lat. *oratorius*, relating to an orator, from *orator*, orator, from *orare*, to pray, as a legal petitioner). The art or act of speaking persuasively to an audience, with elevation of thought and sentiment and corresponding expression.

The art of speaking in public in such a manner as to convince and persuade was one of the first to be developed in comparative perfection. Like other attainments of primeval man, it was crude in its early forms. The oldest record of such speech is what might be expected of Methusael's son Lamech, who, having commanded his small audience to hear his voice and hearken to his speech, declares that he will slay a man for wounding him, and cites an historic precedent in justification. It is the earliest type of oratory—the war harangue, either by way of rousing warlike ardor in the tribe, or of bragging about heroic deeds, as happens among savages to-day. Similar examples of the war speech occur in the *Iliad* and in Herodotus and Thucydides, all the while growing longer and fuller of form and art with progress in literary cultivation.

After the military address, as of generals to armies, and often with it, other forms began to be evolved as races emerged from barbarism. When a sense of equity and regard for human rights prevailed over despotic might sufficiently to establish tribunals, it became necessary that men should defend their own interests. As these soon began to be sacrificed to the difference in natural ability which prevails in communities, the monopoly of speaking in courts passed to the skilled advocate, who first had written the client's argument for him to deliver in person, and who later became his proxy in speaking. Three names mark the progress of this movement in the fifth and fourth centuries B.C.—Corax of Syracuse, who attempted to make every man his own advocate by furnishing him a blank brief which needed but little variation in filling at a time when the purpose of most litigation was to recover alienated estates; Lysias, who wrote arguments with more reference to the character and rank of the several clients who were to deliver them; and finally Isocrates, who instructed men of native ability in the principles and practice of oratory, into whose hands the business of advocacy at length passed from the unskilled citizen and the professional logographer. In this school of Isocrates the great orators of Greece were trained, and by him eloquence was raised to a height corresponding to that of the contemporary art of sculpture. His own Eulogy on Athens was the labor of years, and at the age of ninety-eight he is said to have been still revising and correcting it. It was copied and recited in all Hellenic lands.

To the oratory which arose from the maintenance of personal rights in courts of law another kind was added when government by popular legislation succeeded despotism, and deliberative speaking in the assembly followed forensic in the tribunal. This political oratory Isocrates principally taught, and from his school proceeded a group known as the Attic Ten (eight in addition to Isocrates and Lysias), who contributed to the literature of ancient eloquence its choicest examples. At the same time they illustrated several styles which have proved most effective, establishing the truth that excellence is not the sole prerogative of any one of them. Andocides, for example, represented natural orators, who rely upon native gifts and have a corresponding contempt for rhetorical precepts and methods. As a consequence he was sometimes obscure, irrelevant, and careless in arrangement; carrying his point by keeping in sympathy with his audience, interesting them by anecdotes, and by making his plain speech still clearer by abundant illustration—his energy and self-conceit bringing him through difficulties that might have foiled more sensitive speakers. Isæus exemplified a step forward by his skill in arranging his arguments and massing them with cumulative force, without loss of the animation and vivacity which are the dependence of the natural orator. Hyper-

ides used still greater craft in the disposition of his material—a matter of great importance to the ancients—emphasizing his strong points, artfully concealing his art, popularizing his diction with colloquialisms, a general speaker with a variety of graces, witty, sarcastic, playful, and grave by turns. Æschines was a man who did not permit a natural gift of spontaneous eloquence to lead him into the pitfalls of extemporization, but habitually practiced composition, to which he added a careful study of literature, together with such training in delivery as the stage could give. In consequence his speeches were sometimes called greater than himself, too theatrical for reality. This was not the charge against Demosthenes, with whom he had the honor to be associated in the famous case of the Crown, and in whom Attic oratory culminated. Having had its rise in the dialectics of the Sophists and the formal rhetoric of the Sicilian forensics, it took on by turns leading phases in the solemnity of Thucydides, the majesty of Pericles, the stateliness of Antiphon, the plainness of Lysias, the ornateness of Gorgias, the elegance of Isocrates, the artlessness of Andocides, and the vigor of Isæus. All these were aspects of eloquence by which Demosthenes profited. By study of them all he gathered from each the best, making such selection and combination with his own personal gifts as placed him above them all.

These gifts did not at first promise the final achievement. With neither good voice nor commanding presence, short-breathed, defective in articulation, clumsy in manner, Demosthenes on his first appearance in the assembly aroused uproarious and derisive laughter. But he determined to be heard later. He ran up hill, declaimed by the seashore, gestured before a mirror, and learned from actors the outward signs of eloquence. To getting the inner spirit and power were devoted seven years of apprenticeship in speech-writing and studies in history and law, politics and economics, with civil cases in courts, until he began to discuss State affairs in the assembly and to assert for Athens her leadership and to rouse her slumbering patriotism. Then there was the ethical element as the basis of all, giving irresistible force to his clear, terse, and direct address. What is honorable, for States as for citizens, as distinguished from what is expedient, was the undercurrent of his discourse; so what was best for the whole country rather than what was profitable for his own city. With this main motive underlying the power he had gained by patient toil, he won the primacy in a group not easy to approach. It is not possible to sum up briefly the secret of his surpassing power; but the vast variety which follows exact adaptation to present purpose as related to a final issue covers in a general way the many phases of Demosthenes's eloquence. Like all great masters of art, he could go out of himself to become a part of occasions and opportunities. Losing himself in these, he gained the whole world's tribute of admiration, and his fame still survives as the most eloquent orator of antiquity.

With the decline of liberty Greek oratory began to be imitative, and an age of original production was followed as usual by classification, criticism, and partial reproduction.

Early Roman oratory, like the people, was sturdy and energetic, more practical than imaginative. War, politics, legal and political rights were controlling ideas. Extension of domain and the sway of law were the main purpose of national life, and public speech took its tone from these sentiments. At first it was martial, to soldiers on the field and to the populace on the return from war, when the victor found eloquence an aid in winning civil honors. The courts, too, were an early training ground for speakers, as also the primitive drama had been in both Rome and Greece, in which lengthening speeches of actors finally outgrew dialogue.

Pristine oratory in Italy was exemplified by Cato the Censor in the first half of the second century B.C. Austere, reserved, morose, as Cato was, his speaking was rude, unpolished, and ungraceful, yet clear, concise, and direct, making him a formidable accuser and a strong defender. Contemporary eloquence was marked by a similar vigor and vehemence unaccompanied by Athenian graces, until the Gracchi dropped early harshness and introduced a milder and freer mode. Their successors, condescending to learn at Athens, began to elevate the art to the eminence attained by Greek genius. Marcus Antonius was master of point and pathos; Licinius Crassus of perspicuity and the union of brevity with elegance; Cicero reached the height of Roman eloquence.

For one hundred years increasing refinement had been adding imported grace to native strength. Cicero, after the custom of his time, sought foreign accomplishments in the rhetorical schools of Greece and Asia. At forty he was skilled beyond his contemporaries as a forensic and deliberative orator. His excellence lay in harmonious and full development more than in possession of special aptitudes alone. Skilled in all the arts of discourse, like the rhetorician that he was, methodical in arrangement, adroit in treatment of subject and audience, resourceful, versatile, adaptive in discussion; copious, lucid, graphic in diction; flexible, rhythmical, harmonious in style; plausible, felicitous, brilliant in manner; knowing the power of an apposite word and a fitting phrase, always adapting his mood to that of his hearers in order to bring them eventually to his own position—these were Cicero's virtues, ranging over the whole field of oratorical possibilities. Adapting himself to every class of subjects, he also brought himself into harmony with the structure of the Latin language, which required fullness for perspicuity; also into sympathy with Roman taste, which loved the swell and the rhythm, the balance and the cadence of sonorous sentences. His copiousness sometimes runs into verbosity and his elaboration into artificiality; but his customary wealth of diction, solid argument, philosophic sentiments, and fervent declamation captivated his hearers and carried his points by persuasion, if not by conviction. Cicero spoke right onward toward the end and object of discourse, reducing his usual amplification to briefest enumeration, making his speech both clear and stimulating. Better than all else, he possessed the ethical element which is the foundation essential to all effective speaking, an honesty and sincerity which is everything to the unskilled, and without which brilliant eloquence is mere trickery. His aim was to do right; his mistakes were those of his judgment rather than his heart. In a sense his eloquence was

complementary to Demosthenes's, his acknowledged master. If not so energetic, it was more vivacious, enlivened with a wit which the terribly earnest Greek did not possess. If it did not sweep down throngs with chain shot, there was much display of flash and fire, which pleased by picturesqueness and accomplished the same purpose with superficial hearers, that is with the majority. If it was more wordy, the people whom it addressed and the language they used demanded more leisurely thought and more expanded expression; but together these two leaders of speaking men in the two dominant nations of ancient Europe achieved every excellence of oratorical form and manner. What they lacked was not yet revealed—the higher reaches of ethics and a more comprehensive kindness.

When this revelation came, after the decline in eloquence with the loss of liberty that followed Cicero's age, a new spirit seized upon old forms. While Quintilian, the rhetorician, was gathering up the remains of Latin oratory, as Aristotle had done with Greek oratory, a provincial, Paul of Tarsus, was declaring Christianity at Rome and Athens and in the provinces. Later, Athanasius took up its defense and propagation at Alexandria, Chrysostom at Antioch, Basil and the Gregories in other cities, while the Latin Tertullian at Carthage, Ambrose at Milan, and Leo at Rome exemplified the new eloquence, and founded a new empire upon the ruins of the old. This eloquence had a freedom and irregularity which could not be restrained within classic bounds, as the new wine could not be kept in old bottles; but it was suited to the work it had to do, and it did it well.

When zeal took on a crusading temper another and wilder style of preaching was addressed to mobile multitudes, starting them toward Palestine by its harangues and keeping them moving by continual exhortation. Such was the oratory of Peter the Hermit. These pilgrimages from the West into the East being over, oratory subsided into the eccentricities of mediæval preaching against which Dante inveighed, angrily declaring that certain priests were bent only on amusing with jests and idle tales, so that their flocks went home fed on wind. The *Exempla* of Jacques de Vitry bear witness, also, to the mediæval, yet not wholly mediæval, appetite for anecdotic sermons. Oratory was once more infused with earnestness at the Reformation; its classic forms were recalled with the rise of great preachers like Bossuet; it reflected the stormy aspects of the French Revolution, and reappeared in its better phases in the parliamentary eloquence of Great Britain in the last half of the eighteenth century.

This was nearest to a repetition of the ancient periods of classical eloquence that has occurred, and one of the results of the revival of Greek learning. The education of deliberative orators like Pitt and Mansfield, Burke and Fox, was chiefly in the oratory of antiquity. From its best examples each gathered such features as were worth most to him: Pitt, simplicity of treatment, luminousness of statement and illustration, enforced by impetuousness of delivery; Mansfield, a statement of his case better than most men's arguments, leading hearers step by step irresistibly to his conclusions; Burke, who combined the study of ancient classics with those of his own country, gaining from both the power of common words effectively placed, and of the sonorous sentence when needed; Sheridan, more Asiatic in manner, as Fox was Attic—all of them, and others, too, having their counterpart in men who lived twenty centuries before, a group of statesmen orators whose equals collectively and individually have appeared but once in history, and whose works remain as the second embodiment of eloquence in the records of human speech.

It is not an idle boast to say that a third period is found in the century between 1765 and 1865 in our own land. Questions of colonial confederation, of independence, of self-government under a constitution, of reserved and delegated rights, of extension or extinction of slavery, of war and reconstruction, formed a series of issues demanding political wisdom and involving earnest discussion, which incidentally trained three generations of orators. Their model at first was British eloquence. The fathers read it and replied to it in a manner to compel the respect and praise of English statesmen. Patrick Henry, Richard Henry Lee, Drayton, and the Rutledges and their compeers in the South, and James Otis, the Adamses, Hamilton, Jay, and their fellow patriots in the North, led the people in the war of ideas and words which preceded the strife of arms. In the Congress of the new nation three men came to the front in the early part of the nineteenth century, who represented as many sections of the country and styles of oratory. Of these Henry Clay was earliest and longest in legislative halls. Frank and bold in nature, honest and sincere in conviction, ardent and hopeful in temperament, he had a rare power of inspiring others with his own sentiments and expectations. His clear and positive views were expressed in lucid terms addressed to the understanding of the people with a freedom and unconstraint that belonged to a new country, and on the floor of Congress his magnetic presence and flowing speech won the hearts of many who could not agree with his political doctrines. He reached more of his countrymen in all sections than any other contemporary, standing as he did on middle ground geographically and politically. An extreme Southern position was held and defended by Calhoun, a man of rigid logic, commanding more respect than enthusiasm, sincere, devoted, persistent; calm and impressive in manner, or vehement and fiery, but relentless in his inexorable demonstration of what he believed to be true. For the North of his day Daniel Webster stood and spoke. Though somewhat academic in his early manner, he found later the value of plain words with plain people and of the best English with everybody. Having a strong grasp of legal principles at the bar and broad views of national questions in Congress, he added perspicuity and energy, vigor of reasoning and felicity of diction to a majesty of voice, presence, and personality which delighted, impressed, and awed assemblies beyond all that the printed pages of his speech can convey. History and tradition alone can prolong his fame.

In the department of occasional addresses, commemorative, eulogistic, and expository, Webster had an eminent successor in Everett, whose eulogy upon Washington is the best example of its kind. The approach of the Civil War gave a fresh impulse to genuine oratory through the magnitude of the issues at stake. In Congress,

Sumner, whose academic discourse had been heavy as cloth of gold with ancient spoils, now devoted his wide learning, moral force, and commanding eloquence to the cause of unqualified freedom throughout the land. The same demand was made before popular assemblies by Wendell Phillips in his own way and by a manner of speech that for convincing an audience against its understanding and persuading it against its will has seldom been surpassed.

BIBLIOGRAPHY. For general view and reference: Sears, *History of Oratory from the Age of Pericles to the Present Time* (Chicago, 1896); also his "Introduction" to the *Library of Modern Eloquence* (New York, 1901). For ancient oratory: Jebb, *Attic Orators* (London, 1876); Mahaffy, *History of Classical Greek Literature* (New York, 1880); Crutwell, *History of Roman Literature* (London, 1898); Cicero, *Oratory and Orators*, and *Brutus* (ib., 1871); Tacitus, *Dialogus de Oratoribus* (ib., 1865); Longinus, *On the Sublime* (ib., 1890); Quintilian, *Institutes of Oratory* (ib., 1865). For patristic and mediæval: Consult the lives of the Christian Fathers in Cave and the *Ante-Nicene Library* (New York, 1895); and biographies of Peter the Hermit, Bernard of Clairvaux, and other preachers of crusades. For Jacques de Vitry, consult Crane, *Exempla*, edited for the Folklore Society (London, 1890). For modern: Cormenin, *Orators of France* (New York, 1847); also biographies and sermons of the great preachers of Louis XIV.'s reign; the *Lives* of the reformers, especially Luther and Latimer; Goodrich, *British Eloquence* (New York, 1861); Nicoll, *Great Orators* (Edinburgh, 1880); Magoon, *Orators of the Revolution* (Cincinnati, 1847); Mathews, *Oratory and Orators* (Chicago, 1879); Parker, *Golden Age of American Oratory* (Boston, 1857). For technique and construction: Aristotle, *Rhetoric*, and its successors to the present day, including the *Lectures* of J. Q. Adams (Cambridge, 1810); of Blair (Edinburgh, 1825); of Channing (Boston, 1856). On special departments: Robinson, *Forensic Oratory* (Boston, 1893); Phelps, *Theory of Preaching* (New York, 1881); Storrs, *Preaching Without Notes* (ib., 1897); Holyoake, *Public Speaking and Debate* (London, 1895); Sears, *The Occasional Address* (New York, 1897); and "After-Dinner Speaking," in *Library of Modern Eloquence* (New York, 1901). And above all, the works of the best orators in all ages.

ORATORY. A chamber or building designed for worship of a private or domestic character. From the earliest days of the Christian Church the use of oratories is traceable; and before the regular organization of parishes they had probably a considerable place in the common, although not in the public worship. Until the middle of the third century A.D. Christians gathered for worship almost entirely in the main hall of some large private house, and when independent church buildings became the rule, the service of prayer and even the celebration of the mass were continued, by superior permission, in many houses. One oratory of the third and another of the fourth century have been recently discovered in Rome. The councils of the Church then legislated against the abuse of such private oratories. Another class of oratories were the memorial chapels erected to noted persons, where mass could be celebrated at the anniversary; only prayer at other times. These were usually circular or polygonal in shape, like that of the father of Saint Gregory Nazianzus. Oratories took on a different character with the opening of the Middle Ages and the distinction was more closely drawn between those where prayers alone could be held and those where mass could be celebrated either on certain days or at any time. The Papal, episcopal, royal, and feudal castles and palaces were not complete without their chapels or oratories. Oratories for mass were under the strict supervision of the local bishop and required his consecration. The Council of Trent placed them under stringent regulations, which have been enforced and developed by later popes, especially Benedict XIV. During the Middle Ages oratories were attached to monastic, cathedral, and other churches, like the famous San Venanzio at Saint John Lateran in Rome.

ORATORY, CONGREGATION OF THE. The name of two religious associations in the Roman Catholic Church.

(1) The Oratory of Saint Philip Neri, the account of whose origin is given in the article on this saint. Unlike most other founders of religious Orders, he had never committed to writing any definite body of rules for the government of the members; even his scattered papers, from which his intentions might have been collected, had been burned by his orders a short time before his death. Soon afterwards, the fathers, at the instance of Baronius, who was then superior, compiled from the existing practices and from memory a rule framed so as to embody the spirit of the founder. This was approved by Paul V. in 1612. The object of the congregation was to carry on Saint Philip's work in his own spirit; its members are a body of priests living in community, but without monastic vows and under a constitution of a very democratic character. They are at liberty to withdraw at any time, and to resume possession of any property they brought with them. There is no general superior; each house is independent, with a superior elected for three years. Seven houses were already in existence at the founder's death; the number increased rapidly, and reached one hundred in Italy alone, twenty-one in Spain, six in Portugal, and eight in France. It is now, however, reduced to a few houses in Italy and Spain. It took a fresh life in England in the middle of the nineteenth century, when John Henry Newman, soon after his change of religion, established at Maryvale, near Birmingham, a house which was afterwards transferred to the town, and later another in King William Street, Strand, London, since transferred to Brompton, near the South Kensington Museum. The English Oratorians, who have mainly been converts, have numbered not a few distinguished men. An account of the London Oratory is given in Bowden, *Life of Frederick William Faber* (London, 1869). The Italian houses also counted many men of eminence in various branches of sacred learning; the great historian Baronius and his continuators; the celebrated explorers of the Roman catacombs, Bosio, Severano, and Aringhi; and the historian Theiner. Consult Villarosa, *Scrittori Filippini* (2 vols., Naples, 1837-42).

(2) The Oratory of Jesus, a French congregation, founded in 1611 by Pierre (later Cardinal) de Bérulle. As early as 1601 he had conceived

the idea of founding a community of priests not bound by monastic vows, and spent a long time in preparation, endeavoring to secure Francis de Sales or César de Bus as its first superior. At the bidding of the Archbishop of Paris he finally undertook the work himself, and began the community life with five associates. The new congregation received Papal confirmation in 1613, under the name of 'Oratory of our Lord Jesus Christ,' when it already numbered seventeen or eighteen members. It soon spread through France, and established a house in Rome in 1618. Unlike the Italian Oratory, it was under one superior-general, elected for life. The founder, who died in 1629, was succeeded by Père Condren. Under the third general, Bourgoing, who held the office from 1641 to 1662, the Oratory began to be implicated in the Jansenist troubles. Some outspoken Jansenists, such as Quesnel, left the congregation to secure greater freedom of action; but others remained, and in 1711 the superior-general, de La Tour, was at the head of the opposition to the Constitution *Unigenitus*. (See JANSENISM.) In spite, however, of the drawbacks which this recalcitrant attitude entailed, the congregation had at the outbreak of the Revolution 70 houses, with 751 members, of whom about one-third were priests. Such distinguished men as Malebranche, Massillon, and Thomassin are among its glories. It was practically extinguished by the Revolution, and did not come into full life again until 1852, when it was revived by six men, among them the famous orator Gratry and the future cardinal Perraud. It was confirmed anew, with some slight modification of the rule, in 1864. Consult: Perraud, *L'Oratoire de France au XVII^ème^ et au XIX^ème^ siècle* (2d ed., Paris, 1866); Tabaraud, *Histoire de Pierre de Bérulle* (ib., 1817); and the historical memorials of the early days contained in the *Bibliothèque oratorienne* (ib., 1880 sqq.).

ORBEGOSO, ôr'bā-gō'sō, LUIS JOSÉ (1795-1847). A Peruvian general. He was born in the Province of Huamachuco, was well educated, and successfully managed the great estates left by his father, besides gaining some military reputation in the war for independence, to which he devoted his wealth. In 1833 he was chosen President by the Constitutional Assembly. A civil war, which broke out in 1834, was peaceably settled, but the revolts of the next year were so much more serious that the President asked help from Santa Cruz, then President of Bolivia. Peru and Bolivia were united in 1836, and Orbegoso became President of the State of Northern Peru, from which post he was ousted (1837) by a force of independent Peruvians and soldiers from Chile. He was exiled, but returned to Trujillo shortly before his death.

ORBICULOIDEA (Neo-Lat. nom. pl., from Lat. *orbiculus*, diminutive of *orbis*, circle). An extinct genus of hingeless brachiopods allied to and closely resembling the modern genus Discina, with which it was formerly considered identical. The shells are thin, depressed, subcircular in outline with eccentric beaks and concentric growth lines, and they vary from one-tenth to two inches in diameter. A slit-like opening in the lower valve served for the passage of a tough muscular pedicle that attached the shell to foreign objects. The genus is represented in all formations from the Ordovician to the Cretaceous in America, Europe, and Asia, and is especially abundant in some shales of Devonian and Carboniferous age.

ORBIGNY, ôr'bē'nyē', ALCIDE DESSALINES D' (1802-57). A French paleontologist, born at Couëron (Loire-Inférieure). He early devoted himself to the study of natural history. In 1826 the Museum in Paris sent him to South America, whence he returned in 1834 with a large collection of notes and specimens. The results of his travels appeared in *Voyage dans l'Amérique méridionale* (1834-47). In 1840 he began the publication of his valuable *Paléontologie française* (14 vols., 1840-51), which he continued until within three years of his death. In 1853 Orbigny was appointed to the chair of paleontology at the Jardin des Plantes, Paris. Among his principal works are: *Cabrie ornithologique des oiseaux d'Europe* (1836-38); *Mollusques vivants et fossiles* (1845); and *Prodrome de paléontologie stratigraphique universelle des animaux, mollusques et rayonnés* (1850).

ORBIL'IUS PUPIL'LUS (*c.*113-*c.*13 B.C.). A Roman grammarian remembered chiefly as the teacher of Horace, who has immortalized him as the 'flogging' (*plagosus*) Orbilius (*Epistola*, ii. 1. 71). He was a native of Beneventum, but settled at Rome during the consulship of Cicero, B.C. 63. After his death a statue was erected to him at Beneventum.

ORBIS PIC'TUS (Lat., World Illustrated). The title of the first successful illustrated manual of instruction for the young, and the most popular and widely circulated school-book ever issued in Europe. It was published by the celebrated educator Johann Amos Comenius in 1657, has been translated into many European and some of the Asiatic languages, and in various modified forms has continued popular, having been issued in many editions down to recent times. This work can be considered as the beginning of the introduction of object-teaching and nature-study into school work. See COMENIUS; EDUCATION; NATURE-STUDY; OBJECT TEACHING.

ORBIT (from Lat. *orbita*, track of a wheel, course, orbit, from *orbis*, circle). In astronomy, the path described in space by a heavenly body. The paths described by the different planets are of elliptic form, and would be accurately an ellipse, were it not for disturbing influences of the other heavenly bodies known as perturbations (q.v.). The complete determination of a planet's orbit is of the greatest importance to astronomers, as it enables them to predict the planet's place in the heavens at any period, and thus to determine the exact date of eclipses of the sun and moon, of transits and occultations of the planets. For the determination of a planet's orbit, it is necessary to know three things: (1) The situation of the plane of the orbit in space; (2) the position of the orbit in this plane; and (3) the situation at a given epoch, and rate of motion, of the planet in its orbit. Since the plane of the ecliptic (q.v.) is for convenience taken as the reference plane, the position of the plane of a planet's orbit is known when its inclination to the plane of the ecliptic (1) and the line of intersection of the two planes (2) are known. The orbit cannot lie wholly above or below the plane of the ecliptic, but must cut it in two points, called *nodes* (q.v.), and the position of

the line of intersection, or line of nodes, is generally given in terms of the longitude of the ascending node. The situation of a planet's orbit in its plane is determined when we know its shape (3), magnitude (4), and the position of its major axis or line of apsides (5). The shape and magnitude of the orbit depend upon the length of its major and minor axes, but astronomers prefer to employ the major axis and eccentricity (see ELLIPSE); and the position of the major axis is known by determining the heliocentric longitude of its *perihelion*. To complete our knowledge of a planet's motion, all we now require are the epoch of its appearance at some determinate point of its orbit, say at the perihelion (6), and the velocity of its motion in its orbit (7), for when this last is known, the law of areas, as given in Kepler's second law, enables us to determine the position of the planet in its orbit at any future period. These seven facts, the possession of which gives us a complete clue to a planet's motion, are called the seven 'elements' of a planet's orbit. What has been here stated concerning the planetary orbits is similarly true of the comets and satellites, though in the case of the latter the effect of disturbing forces is so great as to produce a considerable change of the elements in one revolution. See ELEMENTS.

ORB-WEAVER. A spider of the family Epeiridæ, that spins a wheel-shaped web. The framework of the web is composed of strands of silk that radiate out from the centre like the spokes from the hub of a wheel. When this framework is completed, the spider begins at the centre to spin a spiral line out toward the edge. Whenever the spiral line crosses the spokes it is attached to them. When the outside is reached, the spider begins to spin a closer spiral, gradually approaching the centre. While the threads of the first spiral were smooth, those of the last are sticky. These are the snare threads. The threads of the first smooth spiral, which served merely as a stay, are bitten away during the course of the construction of the new sticky spiral. The webs of some of the orb-weavers are strengthened by zigzag ribbons, while the webs of other species are not complete orbs.

OR'CA. A killer-whale. See KILLER.

ORCAGNA, ôr-kä'nyä. ANDREA (c.1308-c.1368). The greatest Italian artist of the fourteenth century, excepting Giotto. His real name was Andrea di Cione, and he was probably born about 1308 at Florence. He is supposed to have first studied in the workshop of his father, Cione, a famous goldsmith, and to have then passed to the studio of Andrea Pisano, then at work on the bronze baptistery gates. Perhaps he also studied with Giotto, but Pisano's influence upon his art was decisive. His masterpiece of sculpture is the tabernacle at Or San Michele (1359), the most beautiful product of Gothic sculpture in Italy; that of wall-painting, the "Paradise," in the Strozzi Chapel at Santa Maria Novella; that of mosaic work, the façade of the Cathedral of Orvieto; that of tempera-painting, the altar-piece in the Strozzi Palace at Florence. The "Last Judgment" and the "Inferno" in the Strozzi Chapel are inferior to the other part of the trilogy, the "Paradise." Orcagna is more spiritual in feeling and more sculpturesque in rendering than Giotto, and more epic in his compositions. His figures are far more graceful and well proportioned. He mastered tenderness as well as energy of expression, and in painting made great advances in perspective, and in the treatment of light and shadow in sculpture.

Modern study has shattered several of Vasari's and other ancient writers' attributions to this master. It is known that he did not build the famous Loggia dei Lanzi at Florence, or paint the "Triumph of Death" and the "Last Judgment" in the Campo Santo at Pisa. Orcagna's influence was great even beyond Tuscany. Consult Vasari's *Lives* in the edition annotated by Milanesi (Florence, 1878-85), and in the Blashfield translation (New York, 1896); also, Crowe and Cavalcaselle's *History of Painting in Italy* (London, 1864-66); Marcel Reymond, "La sculpture florentine," in *Gazette des Beaux-Arts* (1893-94); Dobbert, in Dohme, *Kunst und Künstler Italiens* (Leipzig, 1878).

ORCEIN, ôr'sē-in, $C_{19}H_{17}NO_3$. An amorphous red coloring matter produced by the action of oxygen and ammonia upon orcin (q.v.). It is freely soluble in alcohol, but only sparingly in water. With metallic salts it yields insoluble colored precipitates (lakes), which are of considerable value in dyeing. Orcein is the chief constituent of commercial archil (q.v.).

ORCHARD (AS. *ortceard, ortgeard*, Goth. *aurtigards*, from *ort*, Goth. *aurti*, Oicel. *urt*, herb; connected with AS. *wurt*, Goth. *waurts*, OHG. *wurz*, Ger. *Wurzel*, Olr. *frem*, Lat. *radix*, Gk. *ῥάδαμνος, rhadamnos* + *geard*, Goth. *gards*, OHG. *gart*, Ger. *Garten*, garden; connected with Olr. *gort*, crop, Lat. *hortus*, garden, Gk. *χόρτος, chortos*, yard). Any plantation of cultivated fruit trees. The fruits usually classified as orchard fruits include apples, peaches and nectarines, plums and prunes, pears, cherries, quinces, and apricots. These are all deciduous fruits. Plantations of citrus fruits, olives, etc., are sometimes referred to as groves and sometimes as orchards, and the same is true of plantations of cultivated chestnuts, pecans, walnuts, etc. In this article only deciduous fruits are considered. In Europe, especially in Germany and France, much of the deciduous fruit is produced on the fruit trees which line the principal highways. There also large quantities of deciduous fruit are grown on walls, espaliers, and cordons, requiring special pruning and training. Practically every farm in America, more particularly in the Northern States and Canada, contains an orchard for family use. The largest commercial orchards in the world are found in America, where the trees are allowed to grow naturally with but relatively little pruning, and where attention is given to thorough cultivation, spraying, and fertilizing. The total value of the orchard fruits produced in the United States in the year 1899 was $83,751,840. The total number of fruit trees that year is reported as 367,164,694, of which 55 per cent. were apple trees, about 27 per cent. peach and nectarine, 8 per cent. plum and prune, and 4.5 per cent. pear; cherry trees stood next in importance, and apricot trees last. Among the more striking developments in modern orchard fruit-growing are (1) the increased attention given to orchard tillage; (2) the practice of spraying to control insect pests

and fungous diseases; (3) fertilizing; (4) thinning; (5) use of small packages in marketing; and (6) the development of cold storage and refrigerator-car transportation.

Formerly the orchard in America was a small adjunct of the general farm. After setting out the trees the orchard was largely left to itself. Occasionally the trees were pruned, but the orchard was seldom fertilized or tilled, and was either left in sod or planted to farm crops. With the increased demand for fruit among all classes of people, greater attention was paid to orchards. In favorable localities they become the most important part of the farm. Gradually whole farms and localities come to be given up to orchards, which in many districts occupy hundreds of square miles.

With the development of the orchard came increased attention to cultural details. Orchards are prepared by deep plowing, subsoiling in heavy lands, and thorough harrowing. After the trees are set they are given as clean cultivation as other farm crops. Hoed crops may be planted between the rows of trees for the first few years, but as the trees increase in size these are more and more restricted to the middle of the rows, until finally when the trees come into bearing the whole space is devoted to them alone. Neither cereals nor tall-growing crops that are likely to shade the trees are sown in the young orchard, nor is the orchard seeded down except under special conditions, as when the trees are growing too rankly and produce little or no fruit. In such cases seeding to cereals, grass, etc., may tend to check growth and throw the trees into bearing. The orchard is plowed in spring as early as the ground can be worked. This is followed by cultivation every week or ten days until about the middle or last of summer, or until the wood growth of the tree has practically ceased. At the last cultivation a cover crop is sown. If the soil is poor in nitrogen a leguminous crop is used, otherwise some cereal or grass may be sown or the weeds allowed to grow. The object of the cover crop is fully to check the growth of the tree for the season, so that the wood may ripen up well before winter. The cover crop also protects the soil from leaching, washing, and puddling in winter. The following spring the cover crop is plowed under, and the summer cultivation repeated. In arid regions irrigation (q.v.) must be practiced. Spraying to check the ravages of injurious insects and plant diseases is considered absolutely essential in American commercial orchards for the production of first-class fruit. (See FUNGICIDE.) The fact that the production of orchard fruits draws on the fertility of the soil in exactly the same manner that wheat, corn, or any other farm crop does, is well recognized, and the orchard is regularly fertilized. Orchards are no longer permitted to bear all the fruit the trees will set, so that the limbs have to be propped up to keep them from breaking. Crops thus produced were found to contain too many small and unmerchantable fruits, besides rapidly exhausting the energies of the tree. Especially is thinning practiced with the more expensive fruits, such as peaches, and in many orchards even the cheaper fruits, like apples, are thinned. The thinning is done soon after the fruits attain the size of the end of the thumb.

In the marketing of fruits much more attention is paid than formerly to the convenience of the ultimate purchaser, i.e. the consumer. Small packages which he can conveniently carry home from market are most in demand. (See MARKET.) Cold storage is being employed not only in the main centres of consumption, but in the fruit districts themselves. It makes possible the prolongation of the marketing from a few weeks to, in some cases, as many months, thus lessening the danger from glut on the market, increasing the net returns to the grower, and greatly prolonging the season when fresh fruits may be obtained by the consumer. Refrigerator cars also make possible the transportation of perishable fruits to distant and better markets. See also REFRIGERATION.

BIBLIOGRAPHY. Thomas, *The American Fruit Culturist* (New York, 1897); Bailey, *Principles of Fruit Growing* (New York, 1900); id., *Cyclopædia of American Horticulture* (New York, 1902). The agricultural experiment stations have published an enormous number of bulletins and reports on the various phases of orcharding, some of which are *Orchard Cover Crops* (New York Cornell Agricultural Experiment Station, Bulletin 198); *Improving an Orchard* (Rhode Island Agricultural Experiment Station, Bulletin 83); *Orchard Experiments* (Massachusetts Agricultural Experiment Station, Bulletin 82); *The Apple Orchard* (Missouri Agricultural Experiment Station, Bulletin 490). Consult also literature under the various orchard fruits. See FRUIT, CULTIVATED; HORTICULTURE.

ORCHARD GRASS, COCK'S-FOOT GRASS (*Dactylis*). A genus of grasses, closely allied to Festuca, having the panicle of flowers mostly on one side of the stem, and the spikelets much crowded into clusters. The common orchard grass (*Dactylis glomerata*), a native of the Northern Hemisphere, grows in tufts in meadows, open woods, etc., from sea-level to high altitudes, and is an important natural pasture grass, since it is much relished by cattle, grows with great rapidity after being cut, yields a large quantity of herbage, succeeds well on most soils and in situations too shady for any other grasses. A large improved variety has been introduced into cultivation. It succeeds well in all parts of the United States except in the extreme South, and in the arid regions of the West, yields excellent hay abundantly, and is unexcelled by other grasses in its yield of aftermath, but its tendency to grow in tussocks is rather against it. This habit may be prevented to some extent by frequently rolling the ground. On this account also it is usually sown mixed with other grasses.

ORCHARD ORIOLE. See ORIOLE.

OR'CHARDSON, WILLIAM QUILLER (1835—). A Scotch genre and portrait painter. He was born in Edinburgh, and was educated at the Trustees' Academy. He exhibited his earliest pictures in the Scottish Royal Academy, but in 1863 he went to London, where he afterwards lived. He became associate to the Royal Academy in 1869 and member in 1877. His work is a pictorial representation of the social side of life, the pleasures of ballroom and drawing room being attractively defined in movement and rich coloring, and graceful and richly robed figures. Among his most important pictures are: "The Challenge" (1865); "The Queen of Swords"

(1877); "Napoleon on Board H. M. S. Bellerophon" (1880), South Kensington Museum; "Un Mariage de Convenance" (1884); "Un Mariage de Convenance—After" (1886); "The Salon of Madame Récamier" (1885); "The Young Duke" (1889); "In the Gloaming" (1901).

ORCHESTRA, ôr'kĕs-trä (Lat. *orchestra*, from Gk. ὀρχήστρα, from ὀρχεῖσθαι, *orcheisthai*, to dance, from ὄρχος, *orchos*, row; connected with Skt. *ṛgh*, to rage). In the Greek theatres, the place allotted to the chorus of dancers; in modern theatres, the part of the building assigned to the instrumentalists, also the parquet; and in the modern concert-room, the place occupied by the instrumental and vocal performers. The word orchestra is also used to denote the musicians collectively, and especially the instruments on which they play.

The modern orchestra (referring to the instruments) is the result of a long and slow development. Before the seventeenth century composers had employed various instruments in the accompaniment of their vocal works. But in the choice of instruments the composers seem to have been influenced more by chance than by any definite plan. In fact, the manner in which many instruments were treated gives conclusive evidence that their nature and possibilities were not at all understood. The development of the orchestra coincides with that of the opera (q.v.). In the first opera ever performed in public, Peri's *Euridice* (1600), the orchestra consisted of a harpsichord, a lute, a theorbo, a lyre, and three flutes. The function of this combination of instruments was to give the very simplest kind of accompaniment to the dramatic recitative. Claudio Monteverde (1567-1643) was the first to discover the nature and relative value of some of the instruments. Yet the instrumentation of his first opera, *Orfeo* (1607), differs little from that of his predecessors. But his *Combattimento di Tancredi e Clorinda* (1624) shows a consciousness of purpose and is full of original and striking orchestral effects. Here we find for the first time the *tremolo* of the strings. The strings, in fact, form the foundation of the orchestra. In this work is also found the first instance of *pizzicato*. Monteverde had discovered that instruments had their own peculiarities, and acting upon this knowledge he became the inventor of a distinctively *instrumental* style; whereas his predecessors wrote a truly *vocal* style for all instruments. Since Monteverde the strings have been regarded as the foundation of the orchestra, and with him the various kinds of viols were employed for this purpose. Alessandro Scarlatti (1659-1725) employed violins, violas, and basses, although their treatment is still very crude. The 'celli generally played in unison with the basses. But occasionally the violas were treated with freedom and were even divided into two parts. The principal woodwind instrument was the oboe; bassoons were used only to strengthen the basses. Legrenzi (1625-90) strengthened the violins, so that his orchestra consisted of 20 violins, 2 violas, 2 viole di gamba (the precursor of the 'cello), 4 flutes, 2 bassoons, 2 cornets, and 3 trombones. About this time the kettle-drums also found their way into the orchestra. But the real art of writing for the strings was not yet known; there was no sonority. To render the harmony fuller the harpsichord was used. Even so great a master as J. S. Bach did not know how to use the instruments. He treats them throughout like voices without the slightest appreciation of tonal color. Handel is not much more advanced. This composer scored heavily for the wood-wind, but with no other purpose than that of reënforcing the strings. In fact, many of his works were reorchestrated by Mozart, and to-day Handel's works are almost exclusively heard with the instrumental rearrangement of Mozart.

Joseph Haydn (1732-1809) is universally known as the father of the symphony (q.v.). At the same time he is also the father of the modern orchestra. When Haydn began his work the string orchestra was pretty well established and its resources known. But the employment of the wood-wind was utterly planless. In 1760 Haydn was appointed director of music to Prince Paul Anton Esterházy. At first his orchestra numbered only 17 instruments, 6 violins and violas, 1 'cello, 1 double-bass, 1 flute, 2 oboes, 2 bassoons, and 4 horns. In order to obtain the best effects from this little orchestra, the master directed all his energies to discover and make use of the true nature of the wood-wind. In his first symphony (1759) Haydn uses in addition to the strings (the violins being divided into *first* and *second*) only two oboes and two horns. In his last symphony (D major, written in London, 1795) the score calls for 2 flutes, 2 oboes, 2 clarinets, 2 bassoons, 2 horns, kettle-drums, and the regular strings. In two of his last works, the *Creation* (1798) and the *Seasons* (1801), Haydn employs 2 flutes, 2 oboes, 2 clarinets, 2 bassoons, 1 contra-bassoon, 2 horns, 2 trumpets, 3 trombones, kettle-drums, and the strings. And here we have the modern *symphony orchestra* (which, however, usually has four horns).

Mozart did not add any new instruments. His great merit is the development of the clarinets as permanent orchestral instruments. In fact, Haydn himself admits that he learned the use of not only the clarinets, but of several other instruments, from the considerably younger Mozart. Strange to say, Mozart does not employ clarinets in his *Jupiter Symphony*. In the score of the *G Minor Symphony* the clarinets were added later. In his first two symphonies Beethoven employs the same instruments as Haydn in his last, with the addition of two trumpets. In the *Eroica* (1803) Beethoven separates the 'celli and basses and introduces a third horn. In all subsequent symphonies the master continues to separate the 'celli and double-basses, but returns to the use of only two horns. In his last symphony, the *Ninth*, the orchestra is considerably increased. This score calls for 2 flutes, 1 piccolo, 2 oboes, 2 clarinets, 2 bassoons, 1 double-bassoon, 4 horns, 2 trumpets, 3 trombones, kettle-drums, cymbals, triangle, bass drum, and the regular strings. This is the *grand symphony orchestra* of to-day. All composers since Beethoven (Schubert, Schumann, Mendelssohn, Brahms, Tschaikowsky, Dvořák) have used it, the only addition being the *bass tuba* as the lowest instrument of the trombone choir.

The modern *opera orchestra* is still larger and employs many other instruments to obtain special characteristic effects. This colossal combination of instruments was developed by two men, almost independently of one another—Wagner and Berlioz. Wagner started with the

grand symphony orchestra of Beethoven. Since *Tannhäuser* (1845) the division of violins into four parts has been frequently employed. In *Tristan* Wagner divides the strings into no less than *fifteen parts!* Since *Lohengrin* (1850) the *opera orchestra* consists of *three* of each family of the wood-wind instruments. The number of flutes and bassoons is increased to three; to the two oboes is added the cor anglais (q.v.) (an alto oboe); to the two clarinets the bass clarinet. This increase naturally calls for an increase in the number of the strings. For the *Ring des Nibelungen* Wagner requires 3 large flutes, 1 piccolo, 3 oboes, 1 English horn, 3 clarinets, 1 bass-clarinet, 3 bassoons, 1 contra-bassoon, 8 horns, 3 trumpets, 1 bass trumpet, 2 tenor trombones, 1 bass trombone, 1 contra-bass trombone, 4 tubas (specially constructed for Wagner, 1 tenor, 2 bass, and 1 contra-bass), 6 harps, 2 pairs of kettle-drums, 1 glockenspiel, bass and snare drums, cymbals, tamtam, and even tuned anvils. It goes without saying that the number of strings must be in proportion. Wagner demands as a minimum 34 violins (18 first, 16 second). The demands made by Berlioz in his *Requiem* are unique. He calls for 4 flutes, 2 oboes, 2 clarinets, 8 bassoons, 12 horns, 4 cornets, 12 trumpets, 16 trombones, 4 ophicleides, and 8 pairs of kettle-drums, and indicates the strength of the strings by demanding 18 double-basses.

The following table shows the number of instruments composing some of the most celebrated orchestras of to-day:

	Gewandhaus, Leipzig	Philharmonic, Vienna	Philharmonic, London	Philharmonic, New York	Boston Symphony, Boston	Conservatoire, Paris	Crystal Palace, London	Bayreuth Festival, 1876	N.Y. Festival, Thos. Thomas (1882)	Handel Festival, London (1880)
Flutes	2	2	2	3	3	4	2	3	6	8
Piccolos	...	1	1	1	1	1	1	1	2	6
Oboes	2	2	2	3	2	2	2	3	4	8
English horns	1	1	1	1	1	...	1	1	2	...
Clarinets	2	2	2	3	3	2	2	3	6	8
Bassoons	2	2	2	3	3	4	2	3	6	8
Double bassoons	1	1	1	1	1	1	1	1	2	2
Horns	4	4	4	4	4	4	4	8	11	12
Trumpets	2	4	4	3	4	2	2	3	14	6
Trombones and tubas	4	4	4	4	8	4	4	9	12	12
Harps	1	2	1	1	1	1	1	6	6	...
Violins (First)	14	20	14	20	16	15	14	16	50	92
Violins (Second)	14	20	12	16	14	14	14	16	50	85
Violas	9	6	10	14	10	10	10	12	36	57
'Celli	12	12	10	14	10	12	10	12	36	58
Basses	6	10	8	14	8	9	10	8	40	48

Consult: Elson, *Orchestral Instruments and Their Use* (Boston, 1903); Henderson, *The Orchestra and Orchestral Music* (New York, 1899); Corder, *The Orchestra and How to Write for It* (London, 1896). See INSTRUMENTATION.

ORCHESTRATION. The art of scoring a musical composition for the different instruments of the orchestra. See INSTRUMENTATION.

ORCHESTRION, ôr-kĕs'trĭ-ŏn (from *orchestra*). A mechanical instrument with powerful reed pipes. By skillful devices almost all the wind instruments of the orchestra are imitated. The idea was originally conceived by a Frenchman, M. de Saint-Pern, in 1870. It was then perfected by F. T. Kauffmann, and is to-day extensively used in places of amusement instead of a regular orchestra.

ORCHID, ôr'kĭd (from Lat. *orchis*, from Gk. ὄρχις, testicle, orchid, so called from the shape of the roots). The common name of members of the family Orchidaceæ, which has the most highly organized flowers among monocotyledons. Although beautiful orchids occur in the temperate regions, such as species of Habenaria (rein orchis), Pogonia, Calopogon, Calypso, Cypripedium (lady's slipper, moccasin-flower), etc., their chief display is in the tropics. There are more than 400 genera and a conservative estimate puts the number of species at 6000, while those that have been proposed amount to 10,000 or more. The flowers, which may be solitary, racemed, or spiked, are exceedingly irregular, and most elaborately adapted to the visits of insects, a fact discovered by Sprengel in 1793 and more widely proved by Robert Brown in 1833 and later verified in detail by Darwin, Müller, Gray, and others. (See POLLINATION.) The brilliant coloration of the flowers, some of which are fragrant, and their bizarre forms have made them much prized in hot-house cultivation. The most conspicuous structure of the flower is the so-called labellum or lip, which is one of the three petals. This lip is of the greatest importance in attracting insects, guiding them to the nectar, the pollen, and the stigma. In most orchids it is a conspicuous flat and more or less pendant organ, but in Cypripedium (lady's-slipper) it forms a sac which suggests the common name. Another conspicuous feature of the flower is the spur, which is really a prolongation of the base of the labellum, and in the bottom of which the nectar is secreted. In a curious Madagascar orchid the spur attains the length of 10 or 11 inches. A prominent technical character of the family is the fusion of the one or two stamens with the style or stigma, forming a central mass called the column. In general also the pollen is not granular, but the pollen grains cling together in one or more masses (pollinia), which are carried away by insects. The fruit is usually a capsule, the seeds are like fine sawdust in appearance, and are so numerous that a single capsule of a Maxillaria, it has been estimated, may contain more than 1,700,000. The root is usually composed of simple cylindrical fibres, which are often accompanied by one or more fleshy tubercles or bulbs, a tubercle dying and a new one being produced annually. The habits of orchids

are almost as varied as their floral structure, and upon this basis they are often grouped under these heads. Some are saprophytes, and have lost entirely the green color of independent plants, being usually of a brownish or yellowish hue, as the ordinary coralroots of the United States. Other orchids are epiphytes, and are found in the moist atmosphere of tropical or subtropical regions. On account of the special food reservoirs which they develop, they are distorted-looking plants, in general resembling coarse bulbs with not very attractive leaves, but their flowers are often exceedingly brilliant. Among the epiphytic orchids two forms of roots are developed, clinging roots by which attachment is secured, and aërial roots which hang down to absorb water for the plant. The third group comprises the terrestrial orchids, among which are some of the largest and many of the most prized forms. Orchids are found in all parts of the world except the coldest and the most arid, but are most numerous in the humid forests of the torrid zone, and especially in Mexico and Central and South America, which furnish such well-known genera as Cattleya, Odontoglossum, and Oncidium. Calypso borealis ranges in British America, as far north as latitude 68°.

Fully 3000 species are under cultivation, while the hybrids and varieties are innumerable. In the United States, including Alaska, there are about 75 species, distributed in 20 genera, and of these, seven or eight, belonging to the genus Epidendrum, and found in Florida and other Gulf States, are epiphytes, all the other species being terrestial. Few genera except Salep and Vanilla have a commercial value aside from culture as ornamentals. The prevailing colors of orchids are rose, or lilac, yellow, white, and green. The odor of some species resembles that of violets or orris-root. Of North American orchids a number are very striking, especially Arethusa bulbosa, Pogonia ophioglossoides, the purple, white, and the yellow fringed orchids or habenarias, and the showy, the yellow, and the pink lady's-slippers (Cypripedium).

The culture of orchids began in England about 1820, but did not become general in the United States before 1865. There are many fine public and private collections of growing orchids, and almost fabulous prices have been paid for single rare specimens. Many epiphytal orchids may be planted in pots filled with loose fibrous peat; the roots of others are placed in baskets or are fastened to blocks of wood or cork, with a little moss around them to retain moisture, and are thus placed on shelves, or are suspended from the roof of the hot house. Ventilation and temperature must be carefully attended to, and the atmosphere must not be constantly very hot and humid, but seasons of rest must be given to the plants, since in their native climate they have generally a wet and a dry season. Most of the American species can be easily grown in shaded gardens.

Consult: Lindley, *Folia Orchidacea* (London, 1852); Darwin, *The Fertilization of Orchids by Insects* (ib., 1862); Müller, *The Fertilization of Flowers* (trans., ib., 1883); Sander, *Reichenbachia, Orchids Illustrated and Described* (Berlin and London, 1886); Moore, *Illustrations of Orchidaceous Plants* (London, 1857); Warner, *Orchidaceous Plants* (ib., 1877-78); Burbidge, *Cool Orchids and How to Grow Them* (ib., 1874); Williams, *The Orchid-Grower's Manual* (ib., 1885); Jennings, *Orchids* (ib., 1874); Miner, *Orchids, the Royal Family of Plants* (Boston, 1884); Linden, *Les orchidées exotiques et leur culture* (Brussels, 1894); Bohnhos, *Dictionnaire des orchidées hybrides* (Paris, 1895); Cogniaux, *Dictionnaire d'iconographie des orchidées* (Brussels, 1897); Rand, *A Complete Manual of Orchid Culture* (Boston, 1888).

ORCHIL. See ARCHIL.

ORCHOM'ENUS (Lat., from Gk. Ὀρχομενός, *Orchomenos*). A famous ancient city of Bœotia, situated on a spur of Mount Acontium, on the northwest shore of Lake Copais. It seems to have played a great rôle in legendary times as capital of the Minyæ and chief city of Bœotia. A relic of this early age is the bee-hive tomb, or Treasury of Minyas, a work of the Mycenæan civilization, and but little smaller than the 'Treasury of Atreus' at Mycenæ. (See ARCHÆOLOGY.) It was excavated by Schliemann in 1880 and 1886. After the Bœotian conquest Orchomenus was a member of the confederacy, and second only to Thebes. In the fourth century B.C. it appears as bitterly hostile to Theban supremacy and in close alliance with Sparta. In consequence after the battle of Leuctra (B.C. 371) the Thebans destroyed the city and sold the inhabitants into slavery (B.C. 368); restored by the Phocians, it was again destroyed in B.C. 346. Rebuilt by Philip or Alexander of Macedon, it continued to exist in Roman times. Orchomenus was chiefly noted for its worship of the Charites or Graces, here ancient and powerful goddesses of light and bringers of fruitfulness. Their festival, the Charitesia, was accompanied by musical and poetic contests, of which records are preserved in inscriptions containing the names of the victors. The remains of the ancient walls and the small castle which crowned the Acropolis are still well preserved, and are fine examples of the best period of Greek fortification. Consult: K. O. Müller, *Orchomenos und die Minyer* (Breslau, 1844); Leake, *Travels in Northern Greece*, ii. (London, 1835); Schliemann, "Orchomenos" (Leipzig, 1881; translated in *Journal of Hellenic Studies*, ii. 1881); Schuchhardt, *Schliemann's Excavations* (London, 1891); Frazer, *Pausanias*, v. (ib., 1898). (2) Orchomenus was also the name of a town in Northeastern Arcadia, represented in the legends as of much importance during the heroic age, but of little importance in later times. Its situation on a lofty hill commanding the roads from Mantinea to the north made it a position of some strategical value during the time of the Macedonian wars and the Achæan League.

ORCIN (from *orchil*, *archil*, from OF. *orchel*, *orchel*, *orseil*, Fr. *orseille*, It. *orcella*, *oriello*, archil; of uncertain origin). $C_7H_8O_2 + H_2O$. A colorless substance contained in the lichens from which the commercial coloring matters archil and litmus (qq.v.) are made. It has a sweetish nauseating taste, but no odor, and is soluble in water, alcohol, and ether. In the hydrated state it melts at 58° C.; in the anhydrous state at 108° C. Its chemical constitution is represented by the formula $C_6H_3(CH_3)(OH)_2$, showing it to be a di-oxy-toluene. Besides being contained in the lichens ready-formed, it is produced in considerable quantities from the orcellinic acid contained in the lichens when the latter are heated

with lime. It has also been prepared artificially. When exposed to the simultaneous action of ammonia and oxygen, orcin is transformed into orcein (q.v.).

OR'CUS. The Latin name of Hades.

ORD, EDWARD OTHO CRESAP (1818-83). An American soldier, born at Cumberland, Md. He graduated at West Point in 1839, was commissioned a second lieutenant in the Third Artillery, and sent to Florida, where he took part in the Seminole War (1839-42). During the war with Mexico he performed garrison duty at Monterey, Cal. (1847-49), and in 1850 was promoted to be captain. During the following years he was engaged on frontier duty, and saw much active service against the Indians, but in 1859 he was ordered to the East and took part in the capture of John Brown at Harper's Ferry. At the outbreak of the Civil War he was commissioned brigadier-general of volunteers and defeated Gen. J. E. B. Stuart at Dranesville (December 20, 1861). He was promoted to be major-general of volunteers on May 2, 1862, and soon afterwards sent to the West, where he commanded the left wing of Grant's army. For his services at the battle of Iuka (September 19, 1862), he was brevetted colonel in the Regular Army. On July 21, 1864, he was appointed commander of the Eighteenth Army Corps, and took part in the Richmond campaign, but was wounded at the capture of Fort Harrison (September 29, 1864), and was on sick leave until December. For his gallantry on this occasion, he was brevetted major-general in the Regular Army (March 13, 1865), and after his recovery received command of the Department of Virginia. It was largely owing to his skill and energy that Lee's troops were finally headed off and compelled to surrender. He was commissioned brigadier-general in the Regular Army in 1866, and soon afterwards was mustered out of the volunteer service. He retired in 1880, and the next year by special act of Congress was commissioned major-general.

ORDEAL (AS. *ordēl, ordāl,* OHG. *urteili,* Ger. *Urteil,* decision, judgment, from AS. *ā-,* OHG. *ar-, ir-, ur-,* Ger. *er-,* out + AS. *dal,* Goth. *dails, daila,* OHG. *teil,* Ger. *Teil,* part, connected with OChurch Slav. *dělŭ,* part). A practice, which has prevailed among various widely separated nations, of referring disputed questions, particularly such as relate to the guilt or innocence of an individual, to the judgment of God, determined either by lot, or by the success of certain experiments. Of its existence among the ancient Jews we have an instance in Numbers v., where a Hebrew woman, accused of adultery, is required to drink the 'bitter water' as a test of innocence; a similar ordeal for incontinence is said to be in use among the natives of the Gold Coast of Africa. The practice of ordeals as existing among the Greeks is referred to in Sophocles's *Antigone.* Among the Hindus the ordeal has been practiced in nine different ways—by the *balance,* by *fire,* by *water,* by *poison,* by the *cosha,* or drinking water, in which images of the sun and other deities had been washed, by *chewing rice,* by *hot oil,* by *red-hot iron,* and by drawing two images out of a jar into which they have been thrown.

The Celts in Ireland, the Germans before their conversion, and the early Slavs made use of ordeals. After their conversion to Christianity they employed ordeals with the full sanction of the Church. In the early Middle Ages there was no trial in the modern sense of the word. The accused was required to prove his innocence by compurgation (q.v.), the wager of battle (q.v.), or an ordeal. In the wager of battle and the ordeal of the cross (see below) both plaintiff and defendant were put to the proof, but in all other ordeals and in compurgation the burden of proof rested upon the negative. Christian rites took the place of pagan ceremonies and God was called upon to show the truth. The forms most commonly employed were the ordeals of boiling water, of fire, of red-hot iron, of cold water, of the cross, of the *corsned,* and of the eucharist.

In the ordeal of boiling water the accused was obliged to insert his hand into a caldron of boiling water. Sometimes he had to take out a small object; in some cases he put in his hand only as far as the wrist; in the triple ordeal, as far as the elbow. After the trial the hand was sealed up for three days. Innocence or guilt was held to be proved by its condition when unsealed. In the ordeal of fire, the original custom may have been that the accused placed his hand in the fire. Later two piles of wood were laid a short distance apart and then were set on fire. The accused walked between the two. In such cases it is probable that fifteen days were allowed to the accused before his injuries were inspected. The genuineness of relics was often tested by this ordeal. The ordeal of red-hot iron was employed in two forms. In one case 6, 9, or 12 red-hot plowshares were placed on the ground, among which the accused walked blindfolded, and his innocence was shown by his avoidance of them; or he was compelled to step on each. In the second form the accused was compelled to carry a red-hot iron, usually for a distance of nine feet. This ordeal was generally chosen by persons of rank. The ordeal of cold water rested upon the belief that the water when sanctified by religious rites would refuse to receive the guilty, while the innocent would sink. This method long remained in use for witches. In the ordeal of the cross, both accuser and accused stood with uplifted hands before a cross and the one who kept his position longest won. This was prohibited by the Emperor Louis the Pious (814-40), but was frequently employed. The *corsned* was in use by the Anglo-Saxons and was carried out by giving the accused a piece of bread or cheese to swallow. If he was successful he was innocent. The ordeal of the eucharist was similar. In all of the forms the ordeal was administered only after special religious services.

Other kinds of ordeal were practiced under particular circumstances in different parts of Europe. In the ordeal of the *bier,* a supposed murderer was required to touch the body of the murdered person, and was pronounced guilty if the blood flowed from his wounds.

Trial by ordeal at first carried with it the sanction of the Church, as well as of the civil power, though the clergy in the course of time came to discountenance it. At the fourth Lateran Council in 1215 ecclesiastical ceremonies at ordeals were absolutely forbidden. Secular rulers followed the Pope's example in condemning the ordeal, and it was abandoned generally in the thirteenth century, although, as noted above, cer-

tain isolated usages long prevailed. Consult: Schlagintweit, *Gottesurtheile* (Munich, 1864); Lea, *Superstition and Force* (4th ed., Philadelphia, 1892); Patetta, *Le ordalie* (Turin, 1890); Brunner, *Deutsche Rechtsgeschichte* (Leipzig, 1892); Thayer, *Preliminary Treatise on Evidence*, etc. (Boston, 1896).

ORDER (Lat. *ordo*, row, series, orderly arrangement; connected with *oriri*, Gk. ὄρνυμι, *ornymi*, Skt. *ar*, to rise). A term used for a group of plants or animals in classification (q.v.).

ORDER. A term used in classic and neoclassic architecture to designate the fundamental characteristics of each architectural style as marked by a vertical section of the façade consisting of a column (q.v.) with its entablature (q.v.). The Greeks were familiar with two orders: the *Doric* and the *Ionic*; the *Corinthian*, though also invented by them, hardly attained to the dignity of an order until Roman times. The *Tuscan* was a variant of the Doric, invented by the Etruscans and other early Italian races, and perpetuated by the Romans. The *Composite* was a novelty of the Roman Imperial period, combining Ionic and Corinthian characteristics in a rich design pleasing to the Roman love of ornament. See COLUMN.

ORDERLY. In the United States Army, the term applied to officers or soldiers engaged in the transmission of orders from a superior officer to the details of his command. Duty rosters are kept by the regimental adjutant, regarding the detail of orderly officers, and by the regimental sergeant major as regards the detail of non-commissioned officers. The orderly officer, or officer of the day, is the officer detailed for the superintendence of the interior economy of the command. (See GUARD.) In the company the first sergeant performs the duties of orderly sergeant. A guard orderly is a specially selected private soldier who is detailed from the guard for duty as commanding officer's orderly. A stable orderly is a soldier detailed for special stable duty under the stable sergeant. In the British Army, as in practically all other European armies, the duties of orderly officers are identical with those of the United States. Orderly sergeants, however, are detailed to attend orderly officers during their tour of duty, as are also orderly corporals. Company orderly sergeants are the duty sergeants of a company, who are detailed for duty with their companies, taking turn, week about, notifying and preparing men for duties, parades, or fatigues, and calling the roll of their companies on parade and in quarters. They are assisted by company orderly corporals, who accompany them when notifying men for duty and at roll call, and who also have the separate duty of superintending the drawing of the daily rations of their companies. This latter duty is performed by the orderly men, who are private soldiers detailed daily, to protect and keep in order the room or mess of which they are members, and in various ways assist the company cook.

ORDERS. Under the general title of orders are usually included monastic orders, orders of chivalry, and orders of merit. There is a certain connection between the first two, as the members of the earliest orders of knights took monastic vows. Again, there is a connection between the last two, as formerly persons distinguished by meritorious service were sometimes, even when not noble, admitted to an order of knights, and gradually membership in these orders became wholly an honorary distinction. Thus, in spite of the vast difference between an ancient monastic order and the present 'Legion of Honor,' it is possible to see the evolutionary process which included under a common designation such widely different organizations.

Monastic orders were the earliest and became very important in the Middle Ages. Under the general term 'monastic' may be included the various orders of canons, such as the Premonstratensians (q.v.), as well as of monks and nuns. Of these orders many are no longer in existence, but the total number, of those extant and extinct, is over five hundred; of these about one hundred and seventy-five adopted the Rule of Saint Augustine; about one hundred and twenty-five the Rule of Saint Benedict; and about seventy-five the Rule of Saint Francis; the others adopted various special rules. For a fuller discussion of monastic orders, see MONASTICISM; CANON; and the names of the several orders.

Orders of knighthood are comparatively modern in their origin, although some have attempted to ascribe to certain ones great antiquity. In the ancient societies there was nothing of a similar nature. The 'equestrian order' or the 'order of decurions' in Rome was entirely different. (See EQUESTRIAN ORDER.) It was believed formerly that Clovis had founded in the fifth century an Order of the Holy Grail, but this is purely legendary. Equally mistaken is the attempt to attribute the beginnings of the orders of chivalry to Charles Martel, who is said to have established the Order of the Genette in 726. The romances of chivalry usually attributed the creation of knightly orders to Charles the Great or King Arthur; but the 'twelve peers of Charlemagne' and the 'Knights of the Table Round' are equally mythical. The mediæval orders, in reality, had their beginning in the Holy Land during the time of the Crusades. The Knights of the Hospital and the Knights of the Temple were the earliest orders, and were alike in requiring their members to be of noble birth, and also to take the three monastic vows of poverty, chastity, and obedience. (See SAINT JOHN OF JERUSALEM, KNIGHTS OF; TEMPLARS.) These religious military orders became very renowned and gained enormous wealth. Their example led to the foundation of other similar orders for the protection of the Holy Land. In all there were about twenty which originated in the Kingdom of Jerusalem. Later some transferred their sphere of action to crusades against the heathen in the West, or to service in the Papal armies. As their members were bound by no national ties, they were of great service to the Church in its wars. The destruction of the Templars and the temporal weakness of the popes in the fourteenth century led to a decline in the importance of these religious orders. Those which still exist, as the Hospitalers do under the name of the Knights of Malta, are merely honorary orders of nobility.

On the other hand, the rise of strong monarchs in the period of the Renaissance led to the creation of royal and noble orders whose members were selected by the kings. By this means the rulers were enabled to confer honorary distinc-

tion upon their favorites, and to bind closely to their own fortunes members of the nobility. Since the age of the Renaissance many orders have been created by monarchs to reward services or merit.

These orders may be classified as royal orders, noble or family orders, and orders of merit; but the last two are scarcely distinguishable in some respects. The royal orders, such as the Garter, the Golden Fleece, or the Black Eagle, are sometimes known as the 'Prime Orders of Christendom.' Membership is usually reserved for persons of royal stock and those who are of the most eminent rank in the European kingdoms. Noble orders, such as Calatrava or Montesa, are few in number, and their members are usually selected from the higher nobility. Family orders, such as the Royal Victorian or the Hohenzollern, are composed of those who have in some way rendered especial service to the reigning family from which the order takes its name. Orders of merit, such as the Bath, Pour le Mérite (in Prussia), or the Legion of Honor, are intended to recompense especially meritorious service of any kind.

Of late years there has been an enormous increase in the number of orders which are now purely honorary. The custom has spread from European countries to Asia, Africa, and the Pacific islands. Probably a majority of the civilized or semi-civilized countries of the world now have one or more orders intended to confer distinction upon their own citizens, but also awarded at times to foreigners who are favorites of the sovereign, or have performed some especial service to the country, or are noted for their conspicuous scientific ability. The *Almanach de Gotha* enumerates more than three hundred and fifty in the different countries of the world; but this list contains some agencies established for the recognition of merit which are not, properly speaking, orders. Thus the Medal of Honor established by the United States in 1862 does not confer upon its possessor membership in an order. In fact, in the United States there are no real orders, with the possible exception of the Cincinnati. The patriotic societies and the many organizations which have taken the name of orders could not be included among orders as usually defined; they are all, even the Cincinnati, omitted from the list in the *Almanach de Gotha*. (See PATRIOTIC SOCIETIES.) Neither is the Victoria Cross, awarded in Great Britain for conspicuous bravery, the insignia of an order. In comparatively recent times several orders, including the Royal Order of Victoria and Albert and the Imperial Order of the Crown of India, have been created especially for women.

The great orders usually have only one class; other orders commonly have three classes: Knight Grand Commanders (K.G.C.) Knight Commanders (K.C.), and Companions (C.). Sometimes an order contains more classes, as the Royal Victoria, founded in 1896, which has five classes, designated, respectively, as G.C.V.O., K.C.V.O., C.V.O., and M.V.O. The last constitutes the fourth and fifth classes; although they are all entitled 'members,' the insignia of those who belong to the fourth class are different from that of the fifth class. The Order of Merit, instituted by Edward VII. in 1902, contains but one class. The insignia naturally vary greatly in the different orders, but almost all consist of either stars, crosses, or ribbons. The Knight Grand Commanders usually have a cross or star on a ribbon worn over the shoulder. The Knight Commanders have a star or other badge, but the ribbon is worn about the neck. The Companions have a badge, but no star or cross. These rules do not hold good for all orders, but they represent ordinary usage in European countries.

Membership in orders is highly prized, but in some countries, especially the United States and France, restrictions are placed upon the acceptance by citizens of such distinctions. By the Constitution of the United States no one holding an office of profit or trust under the Government is allowed, without the consent of Congress, to accept any decoration from a monarch or foreign State. In France, since 1815, although the law has been repeatedly modified, no citizen can be a member of a foreign order unless he receives the authorization of the Government.

The following is a list of the principal orders of the world. Those marked with the asterisk are described in their alphabetical order in this Encyclopædia.

ABYSSINIA.

**Seal of Solomon.*

ANHALT.

Albert the Bear.—An order with five classes, founded by the reigning dukes in 1836. The oval decoration shows a crowned bear mounting a wall, with the motto, *Fuerchte Gott und Befolge seine Befehle*.

Order of Merit for Science and Art.—Founded by Duke Frederick in 1873 and affiliated with the Order of Albert the Bear in 1895.

ARGENTINA.

Argentine Sun.—An order of unknown origin. The decoration is a golden medal, with the sun surrounded by a laurel wreath.

AUSTRIA-HUNGARY.

**Golden Fleece.* See also Plate of ORDERS.

**Maria Theresia.*

**Saint Stephen.* See also Plate of ORDERS.

**Leopold.*

Iron Crown.—A civil and military order, founded by Francis I. in 1816. The decoration is the iron crown of Lombardy under the double-headed Austrian eagle bearing upon its breast a shield of blue enamel with the initial F.

Franz Joseph.—A civil order of merit, founded in 1849 by the Emperor Francis Joseph. The decoration is a red cross with the double-headed eagle, the initials F. J., and the motto *Viribus Unitis*.

Elisabeth-Theresia.—A military order, founded in 1750 by the Empress Elizabeth Christina and reorganized by Maria Theresa in 1771. The order was instituted for twenty generals and colonels, and was conferred after thirty years' service in the Imperial army. It carries with it a yearly pension. The decoration is an eight-pointed star bearing the initials E. C. and M. T. in an oval, with the inscription *Maria Theresia Parentis Gratiam Perennem Voluit*.

Star and Cross.—An order for women of the old nobility, founded in 1668 by the Empress Eleonore to commemorate the recovery of a relic which had been lost.

**Teutonic Knights.*

Military Order of Merit.—An order founded by Emperor Francis Joseph in 1849.

Civil Order of Merit.—An order founded by Emperor Francis Joseph in 1850.

Order of Merit for Science and Art.—An order founded by Emperor Francis Joseph in 1887.

BADEN.

Order of Fidelity.—An order with one class, founded in 1715 by the Margrave Charles William, and conferred on foreign princes and State officials of high rank. The decoration is a cross of red enamel with eight points, the arms connected by intertwined C's, which appear also on the central white field above three rocks, with the legend *Fidelitas*.

Charles Frederick.—A military order of merit, with three classes, founded in 1807 by Charles Frederick, Grand Duke of Baden. The decoration consists of an eight-pointed cross of white enamel within a laurel wreath. The medallion bears the initials of the founder and the legend *Fur Badens Ehre*.

Lion of Zahringen.—An order of merit, established by Grand Duke Charles Louis in 1812 and reorganized in 1877. The central shield of the decoration bears the ancestral castle of the family.

BAVARIA.

**Saint Hubert.*
**Saint George.*
**Saint Elizabeth.*
Max Joseph.

Bavarian Crown.—A civil order of merit, founded in 1808 by King Maximilian I. It is given to State officials of all classes, and confers noble rank on the recipient. Foreigners who have rendered service to Bavaria are also eligible for the order. The decoration is a white cross with eight arms bearing the inscription *Virtus et Honos*.

**Saint Michael.*
**Maximilian.*
**Louis.*
Theresa.

Cross of Merit.—A distinction for voluntary services to the army during the years 1870 and 1871, founded in 1871 by King Louis II.

Military Order of Merit.—An order founded in 1866 by King Louis II.

BELGIUM.

**Leopold.* See also Plate of ORDERS.

African Star.—An order founded in 1888 by King Leopold II. as a distinction for services to the Congo State and to African civilization in general. The decoration, a five-pointed star with laurel wreath, bears the legend *Travail et Progres*.

Order of Merit.—A civil order, founded in 1867 by Leopold II. for civic virtue, and for bravery and self-sacrifice.

BRAZIL.

**Southern Cross.*

Order of Dom Pedro I.—An order founded by Dom Pedro I., Emperor of Brazil, in 1826, and suspended in 1889. It had three classes, the first of which was limited to crowned heads and restricted to 12 members, the other two classes being limited to 150. The decoration was a white cross with five arms on a golden five-rayed star.

**Rose.*

Order of Christ.—A Portuguese order, nationalized in Brazil in 1823. In 1843 it lost its religious character and became a civil order conferred for services rendered by natives and foreigners. It was dissolved in 1890. See CHRIST, ORDER OF THE KNIGHTS OF.

Aviz.—Originally the Portuguese order of the same name extended to Brazil in 1823. The decoration is the same as that of the Portuguese order. See AVIZ.

Saint James. See SAINT JAMES OF THE SWORD.

BRUNSWICK.

Henry the Lion.—A civil and military order of merit, founded in 1834 by Duke William. The decoration is an eight-pointed cross of blue enamel, with red centre, bearing a pillar and a leaping horse in white. The arms of the cross bear peacock feathers and are separated by a W surmounted by a lion. The cross is surmounted by a lion and a crown which suspends it from a red ribbon. The legend is *Immota Fides*.

BULGARIA.

Alexander.—(1) A military order of merit, founded by Prince Alexander in 1881. The decoration, an eight-pointed white cross, with crossed swords between the arms, bears the Bulgarian lion on a red field, with the inscription *Za Chrubrost* (for courage), and the monogram of the Prince. (2) An order of civil merit, founded by Prince Alexander in 1879. The decoration is an eight-pointed white cross bearing in a red field the legends *Saint Alexander* and *God With Us*.

Order of Merit.—An order founded in 1891 by Prince Ferdinand.

CHINA.

**Double Dragon.* See also Plate of ORDERS.

Order of the Precious Star.—An order with three classes.

Order of Merit.—A civil order, with three classes.

CONGO FREE STATE.

**African Star.* See above under *Belgium*.

DENMARK.

**Elephant.*
**Dannebrog.* See also Plate of ORDERS.

FRANCE.

**Legion of Honor.* This is the only existing order in France. So also Plate of ORDERS.

Annunciation. See ANNUNCIADE.

**Saint Louis.*

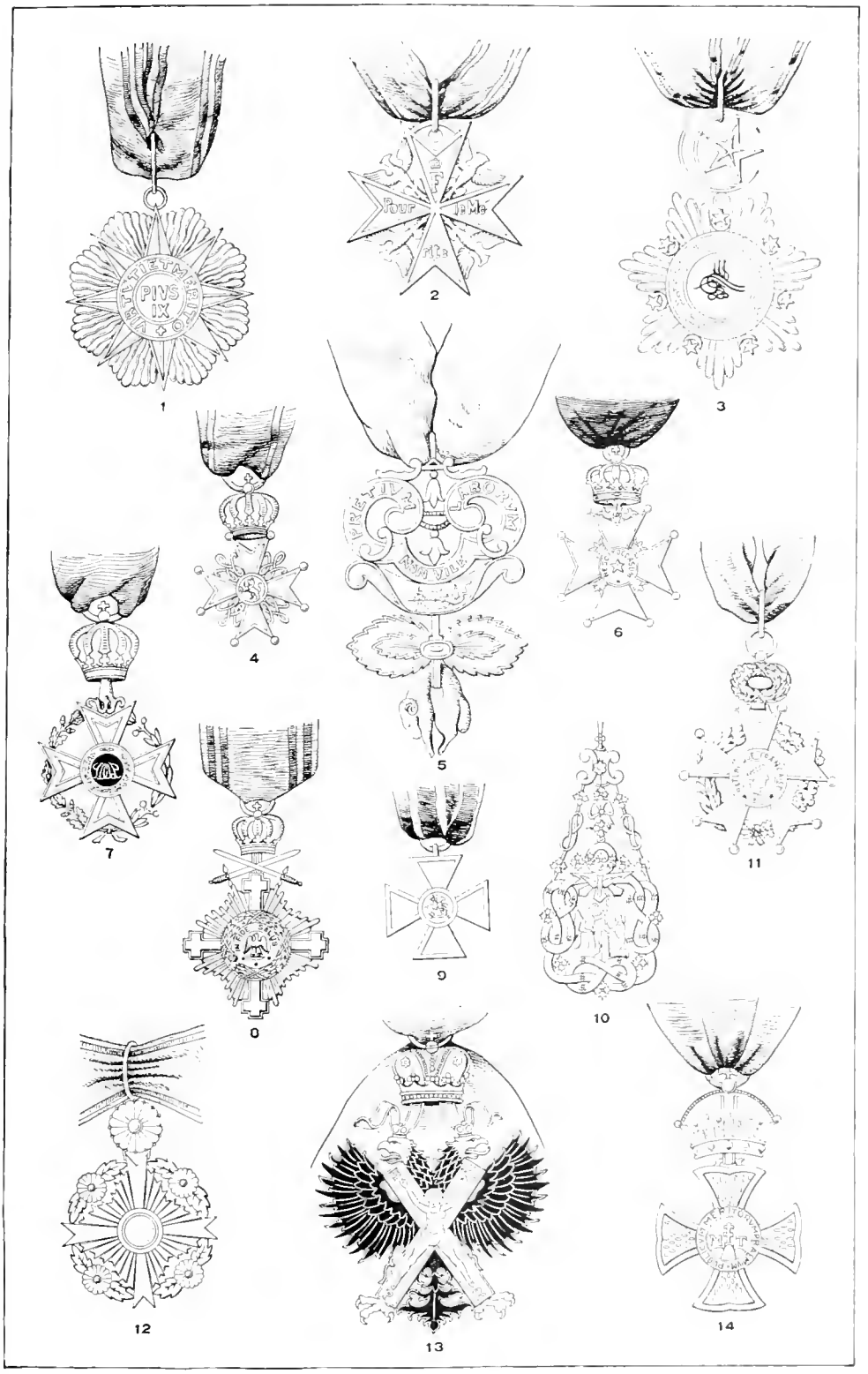
Our Lady of Mount Carmel.—An order founded by Henry IV. The Order of Saint Lazarus in France was later attached to it.

Military Order of Merit.—An order founded by Louis XV. in 1759 for Protestants who could not enter the Order of Saint Louis. It became extinct in 1830.

Saint Esprit. See HOLY GHOST, ORDER OF.
Saint Michael.
**Saint Lazarus.*

GREAT BRITAIN.

**Garter.* See also Plate of ORDERS.
**Thistle.*
Bath. See also Plate of ORDERS.
Saint Patrick.
**Saint Michael and Saint George.* See also Plate of ORDERS.
Victoria and Albert.
Saint Catharine.
**Distinguished Service Order.*
Victoria Cross. See also Plate of ORDERS.



1. PIUS IX., PAPAL
2. POUR LE MÉRITE, PRUSSIA
3. MEDJIDIE, TURKEY
4. LION, NETHERLANDS
5. GOLDEN FLEECE, AUSTRIA
6. NORTH STAR, SWEDEN
7. LEOPOLD I., BELGIUM
8. STAR OF RUMANIA
9. ST. GEORGE, RUSSIA
10. ANNUNCIATION, ITALY.
11. LEGION OF HONOR, FRANCE
12. CHRYSANTHEMUM, JAPAN
13. ST. ANDREW, RUSSIA
14. ST. STEPHEN, HUNGARY

**Red Cross.*

**Star of India.*

Imperial Order of the Indian Empire.—An order founded in 1878 by Queen Victoria on assuming the imperial title.

Imperial Order of the Crown of India.—An order for women, including natives of India, founded by Queen Victoria in 1878.

Order of British India.—An order, with two classes, founded by Queen Victoria in 1837.

Order of Merit for Native Soldiers.—An order with four classes, founded by Queen Victoria in 1887.

Military Order for Natives of British India.—An order founded in 1842.

Royal Victorian Order.

Order of Merit. See MERIT, ORDER OF.

GREECE.

**Redeemer.* See also Plate of ORDERS.

GUINEA.

Black Star.—An order founded by King Tossa in 1890.

HANOVER.

**Saint George.*

**Guelphic Order.*

Order of Ernest Augustus.—A royal military and civil order, established by King George V. in 1865. The decoration is a silver star with eight rays, the monogram E.A. appearing on a red ground, surrounded by a blue band with the motto *Suscipere et Finire*, and a white cross with a similar medallion. The decoration is conferred for services to the country or King, and for distinction in science and art.

HAWAII.

**Kamehameha.*

Kalakaua.—An order of four classes, founded in 1874 by Kalakaua.

Kapiolani.—An order of six classes, with a special class for women, founded in 1880 by Kalakaua. The decoration is an eight-pointed cross of red enamel, surmounted by a crown, with similar crowns between the arms. A central plaque of red bears on a white border the legend *Kulia*.

Hawaiian Crown.—An order with four classes, founded by Kalakaua in 1882.

Star of Oceania.

HESSE.

Louis.

**Philip the Magnanimous.*

**Lion.*

Military Service Cross.—A decoration founded in 1870 by Grand Duke Louis III. for men and women. The cross bears the inscription *For Care of Soldiers, 1870.*

**William.*

HONDURAS.

Santa Rosa.

INDIA.

See above under *Great Britain.*

ITALY.

Annunziata. See ANNUNCIADE; also Plate of ORDERS.

**Mauritius and Lazarus.*

Civil Order of Savoy.—An order with one class, founded by King Charles Albert of Sardinia in 1831. It was included among the Italian orders in 1860.

Military Order of Savoy.—An order with four classes, founded by King Victor Emmanuel I. of Sardinia in 1815.

Crown of Italy.—An order commemorating the union of Italy, founded by Victor Emmanuel II. in 1868. The decoration is a white cross, with the iron crown of Lombardy, the black eagle, and the cross of Savoy.

JAPAN.

Rising Sun.

Chrysanthemum Order.—An Imperial order conferred only on monarchs and the highest State officials, founded in 1876 by the Mikado. The decoration is a star with 32 white rays with four chrysanthemums between green leaves. The obverse of one of the flowers bears the inscription, "Exalted deeds and honorable actions." See Plate of ORDERS.

Order of the Sanctified Treasure.—An order with eight classes, founded by the Mikado Mutsu Hito in 1888.

LIBERIA.

African Liberation.—An order with three classes, established by the Legislative Assembly in 1879.

LUCCA.

Saint George.—A military order of merit, founded in 1833 by Charles Louis, Duke of Lucca.

Saint Louis.—A civil order of merit, founded in 1836 by Charles Louis, Duke of Lucca.

LUXEMBURG.

Oak Crown.

Golden Lion.—An order founded in 1858 by Duke Adolph of Nassau and King William III. of the Netherlands. It consisted originally of only one class, but later was divided into five, and now exists only as an order of Luxemburg with one class. The white cross, the arms of which are separated by golden N's, has a central blue medallion with the lion; on the reverse the motto, "Je maintiendrai." The ribbon is orange with blue stripes.

Adolph of Nassau.—A military and civil order with five classes and two crosses, founded by Duke Adolph in 1858.

MECKLENBURG.

Order of the Griffin.—An order of merit, instituted in 1884 by Grand Duke Frederick Francis III. of Mecklenburg-Schwerin. The insignia are an eight-pointed red cross with a golden medallion bearing a griffin, and an eight-pointed silver star with the legend *Affior Adversis.*

Wendish Crown.

Military Order of Merit.—An order with two classes, founded in 1848 by Grand Duke Frederick Francis II. of Mecklenburg-Schwerin.

Military Order of Merit.—An order founded in 1871 by Grand Duke Frederick William of Mecklenburg-Strelitz.

MEXICO.

Order of Guadalupe.—An order commemorating Mexican independence, founded by Iturbide, restored in 1853 by President Santos, and reorganized in 1865 by Emperor Maximilian, after whose death it expired. The cross had an oval green medallion with the image of Our Lady of Guadalupe, and the inscription *Religion, Independencia, Union*; on the reverse *Al Mérito y Lealtad.*

Mexican Eagle.

See Carlos.

MODENA.

Order of the Eagle of Este.—An order with three classes, founded by Duke Francis V. in 1855

MONACO.

Saint Charles.

MONTENEGRO.

Order of Saint Peter.—A house order with one class, founded by Prince Danilo I. in 1852.

Danilo Order.—A military and civil order with four classes, founded in 1855 by Prince Danilo I. The cross bears the initials of the Prince, the inscriptions, "Prince of the Black Mountains," "For the independence of the Black Mountains," and the date, 1852-53. The grand cross is conferred only on princes.

NETHERLANDS.

William.

Netherland Lion. See also Plate of ORDERS.

Orange-Nassau.

NORWAY.

See section on *Sweden and Norway.*

OLDENBURG.

Order of Duke Peter Frederick Louis.—A civil and military order, founded by Grand Duke Frederick Augustus in 1838. The decoration, a white cross, has a blue medallion with the monogram P. F. L., surrounded by a red band with the inscription *Ein Gott, Ein Recht, Eine Wahrheit.*

PAPAL.

Holy Sepulchre.—See HOLY SEPULCHRE, KNIGHTS OF THE.

Golden Spur.

Christ. See CHRIST, PAPAL ORDER OF.

Saint Gregory.

Pius IX. See also Plate of ORDERS.

Pro Ecclesia et Pontifice.

PARMA.

Constantine Order of Saint George. See SAINT GEORGE, CONSTANTINIAN ORDER OF.

Saint Louis.—A civil and military order of merit, founded in 1849 by Charles III., Duke of Parma.

PERSIA.

Order of Aali.—An order with one class, founded by Feth Aali Khan in 1808.

Order for Women.—An order with one class, founded in 1873 by Shah Nasr-ed-Din.

Sun and Lion. See also Plate of ORDERS.

PORTUGAL.

Avis.

Christ. See CHRIST, ORDER OF THE KNIGHTS OF; also Plate of ORDERS.

Saint James. See SAINT JAMES OF THE SWORD.

Order of the Castle and Sword.—An order founded in 1459 by Alfonso V. and reorganized in 1832 by Dom Pedro. The order is conferred upon foreigners as well as natives for merit, bravery, and distinguished services. The decoration is a five-pointed white cross, having between the upper arms a tower, by which it is suspended. On the medallion is a sword in an oak wreath. The reverse bears an open book. The inscriptions are *Valor, Lealdade, Merito,* and *Pelo Rei e pela Lei.*

Our Lady of Villa Vicosa.—An order of merit, founded in 1819 in Rio de Janeiro by King John VI. The decoration is a nine-pointed star with the inscription *Padroeira do Reino.*

Saint Isabella.

PRUSSIA.

Black Eagle. See EAGLE, BLACK; also Plate of ORDERS.

Red Eagle. See EAGLE, RED.

Pour le Merite. See also Plate of ORDERS.

Prussian Crown.—An order with four classes, founded in 1861 by King William I. in commemoration of his coronation. The cross bears the royal crown with the inscription *Gott mit uns.*

Hohenzollern.—A civil and military order of merit of the princely house of Hohenzollern, founded in 1841 by the princes Frederick William Constantine and Charles Anthony. It was under Prussian protection, and when Hohenzollern was united with Prussia was made in 1851 a royal order with two branches. The Prussian order has four classes. Its decoration consists of a black and white cross, and an eagle, each with the device *Vom Fels zum Meer,* and the date, January 13, 1851. The princely order has four classes, with a golden eight-pointed cross enameled in white and black as a decoration, with the motto, *Fur Treue und Verdienst.*

Iron Cross. See also Plate of ORDERS.

William.

Louise.

Cross of Merit.—A distinction conferred on women for services during the War of 1870-71, founded by Emperor William I., in 1871.

RUMANIA.

Star of Rumania. See also Plate of ORDERS.

Order of the Crown.—An order with five classes, founded in 1881 by King Charles I. It commemorates the elevation of Rumania to a kingdom.

Order of Elizabeth.—An order with one class, founded by Queen Elizabeth in 1878.

RUSSIA.

Saint Andrew. See also Plate of ORDERS.

White Eagle.

Saint Catharine.

Saint Alexander Nevski.

Saint Ann.

Saint Stanislas.

Saint George. See also Plate of ORDERS.

Saint Vladimir.

Red Cross.

SAXONY.

Rue Crown.

Saint Henry.

Order of Merit.—A royal order, founded by Frederick Augustus I. in 1815, with five classes.

Albert Order.—A royal order with four classes, founded by Frederick Augustus II. in 1850. It is conferred for services to the State, for civil merit, science, and art. The white cross bears a portrait of Duke Albert the Bold of Saxony (1443-1500), founder of the Albertine line, surrounded by the inscription *Albertus Animosus,* and the Saxon arms with the date 1850.

Sidonia.

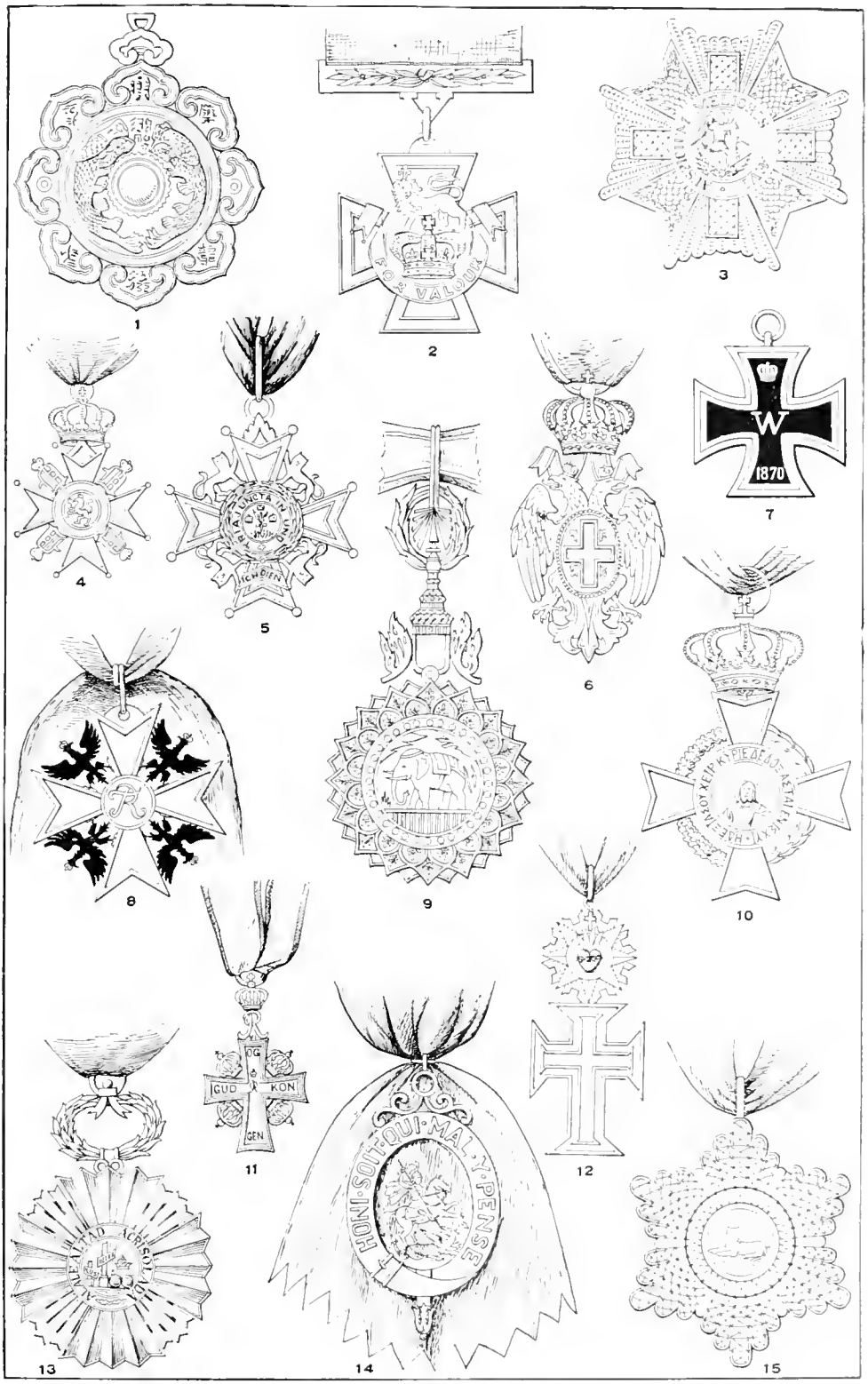
SAXE-WEIMAR.

White Falcon.

Ernestine House Order.—An order founded in 1833 by the dukes of Saxe-Meiningen-Hildeburghausen, Saxe-Coburg-Gotha, and Saxe-Altenburg. The order has five classes, and a silver cross of merit and gold and silver medals are connected with it. The grand cross of the order confers hereditary nobility. The decoration is an eight-pointed white cross edged with gold, having golden lines between the arms. Within a central wreath is the bust of Ernest the Pious with the inscription *Fideliter et Constanter.*

SAN MARINO.

Order of Chivalry.—An order with five classes, founded in 1859.



1. DOUBLE DRAGON, CHINA
2. VICTORIA CROSS, GREAT BRITAIN
3. ST. MICHAEL AND ST. GEORGE, GREAT BRITAIN
4. OLAF, NORWAY
5. BATH, GREAT BRITAIN
6. WHITE EAGLE, SERVIA
7. IRON CROSS, PRUSSIA
8. BLACK EAGLE, PRUSSIA
9. WHITE ELEPHANT, SIAM
10. REDEEMER, GREECE
11. DANEBROG, DENMARK
12. CHRIST, PORTUGAL
13. ISABELLA THE CATHOLIC SPAIN
14. GARTER, GREAT BRITAIN
15. SUN AND LION, PERSIA

SAVOY.

See under *Italy*.

SERVIA.

Takovo.
**White Eagle.* See also Plate of ORDERS.
**Saint Sava.*

SIAM.

**White Elephant.* See also Plate of ORDERS.
**Sacred Order.*

Order of the Crown.—An order of merit founded in 1869. The decoration is a blue medallion with a circle of pearls, edged with red and green lotus blossoms.

Order of Chivalry.—An order with five classes, founded in 1874.

Chakri Order.—An order with two classes, founded in 1884.

Order of Chulakonklao.—A family order with three classes, founded in 1873 by the King of Siam on his accession to the throne. It was intended to be conferred on members of the families of previous kings and to form the basis of a high nobility.

SICILY.

**Saint Januarius.*
**Saint Ferdinand.*
Constantinian Order of Saint George. See SAINT GEORGE, CONSTANTINIAN ORDER OF.
**Saint George.*

Order of Francis I.—A civil order of merit, founded in 1829 by King Francis I., and extinguished in 1861. The decoration was a white cross with golden lilies between the arms, bearing an oak wreath inclosing the initials F. I., with the legend *De Rege Optime Merito.*

SPAIN.

**Golden Fleece.*
**Alcántara.*
**Calatrava.*
**Saint James of the Sword.*
**Montesa.*

Order of Charles III.—A civil and military order, founded by Charles III. in 1771 in honor of the Immaculate Conception. The order was dissolved by Joseph Bonaparte, and restored in 1814. It was conferred on nobles for distinguished services. The cross is of blue enamel with a white border, and the arms are separated by lilies. The central oval bears an image of the Virgin, and on both sides is the inscription *Virtuti et Merito.* The cross is suspended from a laurel wreath.

**Maria Louisa.*
**Saint Ferdinand.*
**Saint Hermengild.*
**Isabella the Catholic.* See also Plate of ORDERS.

Maria-Isabella-Louisa.—An order with one class, founded in 1833 by King Ferdinand VII.

Military Order of Merit.—An order with four classes, founded by Queen Isabella II. in 1864.

Order of Beneralence.—An order with three classes, founded by Queen Isabella II. in 1856.

Naval Order of Merit.—An order with three classes, founded by Queen Isabella II. in 1866.

Order of Maria Victoria.—An order with three classes, founded by King Amadeus in 1871.

Order of Maria Christina.—A military order with three classes, founded in 1890 by the Queen Regent Maria Christina.

SWEDEN AND NORWAY.

**Seraphim.*
**Sword.*
**North Star.* See also Plate of ORDERS.
**Vasa.*

Order of Charles XIII.—An order with one class, founded in 1811 by King Charles XIII. It is designed for Freemasons of the highest rank, and has 30 members. The order provides for the needy children of deceased members.

Saint Olaf.

TUSCANY.

Saint Stephen.
Saint Joseph.

Military Order of Merit.—An order with three classes, founded by Grand Duke Leopold II. in 1853.

TUNIS.

Nishan-el-Aanian.

Order of Hussein.—An order founded by Ahmed Bey, and worn in Tunis only by the Bey and princes, and two of the highest State officials. It may be conferred also on foreign reigning princes and on princes of the blood.

**Nishan-el-Iftikhar.*

TURKEY.

**Crescent.*
Nishan-el-Iftikhar.
Medjidie. See also Plate of ORDERS.
Osmanie.
Nishan-i-Shefkat.
**Nishan-i-Imtias.*

VENEZUELA.

Order of the Bust of Bolivar.—An order commemorating Bolivar's services. It was founded at Caracas in 1854 by President Monagas.

Order of Merit.—An order founded in 1861 by President Paez. It has three classes.

WÜRTTEMBERG.

Order of the Crown.—A civil and military order of merit, founded by King William I. in 1817. The decoration is an eight-pointed cross with lions in the angles, bearing a medallion with the monogram of King Frederick and the motto *Furchtlos und Treu.*

Military Order of Merit.—An order with three classes, founded in 1759 by Duke Charles Eugene.

Frederick Order.—A civil and military order of merit, founded in 1830 by King William I. It had originally one class and conferred nobility. It has now five classes. The cross is of white enamel edged with gold and with golden rays between the arms. The medallion bears a relief bust of King Frederick surrounded by a blue band with the inscription *Friedrich, König von Württemberg.* The reverse bears the motto *Gott und mein Recht.*

Olga.

ZANZIBAR.

**Radiant Star.*

Consult: Lawrence-Archer, *Orders of Chivalry* (London, 1887); Gritzer, *Handbuch der Ritter- und Verdienstorden aller Kulturstaaten der Welt innerhalb des neunzehnten Jahrhunderts* (Leipzig, 1893); *Almanach de Gotha* (Gotha, annually). See also the bibliographies under the separate orders.

ORDERS, HOLY. The distinction of rank or office which differentiates the clergy of various Christian bodies from the laity; also the rite by

which this office is conferred, which is one of the sacraments of the Roman Catholic and Eastern churches. As to the nature of the powers conferred by ordination, an acute controversy has raged for centuries. The principal divergent views will be found partly under BISHOP, especially as to distinctions of polity arising from them; but some further details remain to be given here.

The central point of the Roman Catholic and Eastern doctrine is the belief in the continuous existence of a real priesthood in the fullest sense of the word—of a body whose chief function is the offering of sacrifice. (See SACRIFICE; PRIEST; MASS.) While there is a sense in which the priesthood of all the faithful may be asserted, it is yet contended that in its definite sense and in the fullness of its powers, priesthood is conferred only by the laying on of a bishop's hands. (See APOSTOLIC SUCCESSION.) As a matter of hierarchical gradation, the Council of Trent asserts that the divinely instituted hierarchy consists of bishops, presbyters, and ministers. It follows, however, from what has been said that from another point of view the episcopate and the priesthood are not two separate orders, but the episcopate is simply the fullness of the priesthood, the power of ordination and confirmation being reserved to it. The orders, then, are seven: those of priest, deacon, and subdeacon (major or holy orders), acolyte, reader, exorcist, and ostiarius or doorkeeper (minor orders). The latter as distinct gradations are admitted to be of ecclesiastical institution, and the Eastern churches practically include them all in the single office of *anagnostes* or reader. As to the outward and visible sign which constitutes the 'matter' of the sacrament, there has been considerable difference of opinion among theologians, some making it the 'tradition of the instruments' (the delivery of the chalice and paten to the candidate), while the majority in modern times hold it to be the laying on of hands; practically both are considered necessary. The sacrament is believed to confer an indelible stamp or 'character,' so that a man once a priest is always a priest, and ordination can never be repeated. See DEPOSITION.

The Church of England, followed by her daughter churches, declares that "from the Apostles' times there have been three orders of ministers in Christ's Church, bishops, priests, and deacons," and requires them to be made by the laying-on of the bishop's hands. For various technical reasons, however, the Roman Catholic Church (while not questioning the orders of the Easterns, whom it regards as schismatics) has never in practice admitted the validity of Anglican ordinations; and an exhaustive discussion of the matter in 1896 was followed by a definite Papal decision against them. Much difference of opinion has prevailed in the Anglican communion about the powers conferred, some holding doctrines undistinguishable from those of Trent, while others as emphatically deny the existence of any vestige of sacerdotal power. In practice the indelibility of holy orders is recognized here also, though in England a clergyman may legally renounce his orders and be considered a layman before the law, thus becoming capable of sitting in the House of Commons.

The non-episcopal churches recognize but one order of the ministry, the presbyterate, as having Scriptural sanction. They assert that bishop and elder in the primitive churches were identical in function and authority. There is in many cases in their polities no clear distinction between order and office. The Baptist churches declare that there are but two Scriptural officers of a Christian Church—pastor and deacon. In the polities of the Presbyterian and Reformed churches, the perpetual officers of the Church are declared to be bishops or pastors, ruling elders, and deacons. The Methodist Church in America, while it uses the title bishop, does not differ substantially from the other bodies in this class as to its view of the nature of the ministry.

No study of holy orders can be complete without a consideration of their civil aspects. Here great changes have come about through the changed relations of Church and State. Ever since the Christian Church received the recognition of the political power, and more especially since the development of ecclesiastical establishments, the possession of holy orders has impressed a peculiar civil character upon the individual. For many centuries in all the European States the possession of orders, even the minor ones, caused a greater or less exemption from the jurisdiction of the civil courts. (See BENEFIT OF CLERGY.) By the common law as it has developed in the United States ministerial orders are regarded as voluntary relations which may be terminated at any time by the possessor and as not containing any contractual element. Along with certain benefits there have been certain civil disabilities attached to holy orders. In England and in the State of Maryland a 'minister of the gospel' is not eligible for the Legislature. Exemption from jury duty and service in the militia still generally attaches to the possession of ministerial orders.

ORDERS IN COUNCIL. An English legal term, denoting orders issued by the sovereign with the advice of the Privy Council. The Privy Council of Great Britain has no power to legislate, except so far as authorized to do so by Parliament; but in periods of emergency it has nevertheless occasionally issued and enforced orders of a legislative kind, those who were concerned in passing, promulgating, or enforcing the orders trusting to Parliamentary protection, and taking on themselves the personal responsibility of the proceedings. In such cases a subsequent act of indemnity has relieved from liability those who advised the order or acted under it, and has given compensation to all who suffered by its enforcement. The most famous orders in council were those issued in retaliation for Napoleon's Berlin and Milan decrees. These are described in detail under CONTINENTAL SYSTEM.

ORDINAL (Lat. *ordinalis*, denoting order, from *ordo*, series, row, orderly arrangement). A book containing the forms to be used in making, ordaining, and consecrating bishops, priests, and deacons in use in the Church of England since the Reformation. The original form was prepared by order of the Crown by a commission appointed in the third year of Edward VI. (1550), and received the approval of Parliament. It was slightly amended in the year 1552, and again in 1662 on the recommendation of convocations. Although technically a separate book, the English Ordinal has since 1552 been

bound up with the Book of Common Prayer. In their general structure the offices are similar to those found in the ancient liturgies, although much more simple. The series of questions addressed to the candidates is, however, a feature peculiar to it.

ORDINANCE (ML. *ordinantia*, decree, from Lat. *ordinare*, to order, from *ordo*, row, series, orderly arrangement). In its broadest sense, any law or statute enacted or promulgated by a governmental authority, but more commonly used to designate laws or regulations passed by the governing bodies of municipalities. The term was formerly employed in England to describe a law or regulation which needed the assent of one of the three powers necessary to the validity of an act of Parliament, viz. the King, the House of Lords, and House of Commons. It is now used in England to designate any rule or regulation enacted by any authority less than sovereign. In the United States the term is almost exclusively applied to the laws or regulations passed by the common councils, boards of aldermen, or other governing bodies of municipalities. An ordinance differs from a resolution, which is an expression of the will of any organized body, generally to carry out some ministerial act relating to its own internal management, or other matter not affecting the general public, as a resolution of respect in honor of a deceased person. The formalities for the enactment, publication, enforcement, and repeal of ordinances are largely regulated by statutes. See Act; By-law; Municipality; Resolution; Statute.

ORDINANCE OF 1787. An act of the United States Congress, of July 13, 1787, relating to the government of the Northwest Territory of the United States. See Northwest Territory.

ORDINANCES OF MANU. The English rendering of the Sanskrit *Dharmaśastra*, or code of law, attributed to Manu (q.v.).

ORDINARY. A charge in heraldry (q.v.).

ORDINARY RAY. See Light.

ORDINATE (Lat. *ordinatus*, arranged, ordered, p.p. of *ordinare*, to order). In a system of rectilinear coördinates, the coördinate which is measured parallel to or on the Y-axis. See Analytic Geometry.

ORDINATION (Lat. *ordinatio*, setting in order, from *ordinare*, to order). The ceremony by which a man is set apart to or invested with an order or office of the Christian ministry. Ordination is a general custom throughout the various Christian bodies, both episcopal and non-episcopal. In the Episcopal churches ordination includes as an essential feature the imposition of hands by a bishop. The act of elevating a priest to the episcopate is in strict technical use called consecration, not ordination. In a broader sense, ordination includes admission to the minor orders, when the act of admission consists in the delivery of the symbolic instruments. In the various Presbyterian churches the power of ordination rests with the presbytery, who appoint one or more of their number to conduct the ordination service, which includes the feature of the imposition of hands. In the Congregational and Baptist churches ordination is usually performed by the pastors of neighboring churches of the same denomination, but is regarded as necessary only for the preservation of church order, not as conferring any special religious or ecclesiastical authority. See Orders, Holy.

ORDNANCE (variant of *ordinance*, OF. *ordinance*, *ordonance*, *ordonnance*, Fr. *ordonnance*, ordinance, from Lat. *ordinare*, to order). The word ordnance is now commonly understood to comprise all cannon requiring a support or mounting of some form. The early projectile machines, the bow, cross-bow, sling, catapult, and ballista, are related to modern cannon by the similarity of their purpose only, and have in principle of action and construction no bearing upon the subject of ordnance. The blow-gun, acting by compressed air, has some analogy with the modern pneumatic gun, but teaches no lesson of importance. The use of gunpowder cannon as factors of any consequence in war dates from the fourteenth century, during which period they were used beside the existing catapults with, for some time, less actual effect. The first cannon were wide-mouthed bowls, like an apothecary's mortar, called mortars, vases, bombards, etc. They gave little velocity to the stone projectile, and had little accuracy or power. They were made of bars (like barrel staves) wrapped and hooped to obtain necessary strength. Some were breech-loaders, but were so crude that they were given up for the simpler muzzle-loader. The guns of this time had no trunnions, and many not even carriages, being fired from the ground. Some were mounted on blocks of timber to which they were lashed with no movement for aiming. Later improvements in shape were made, the bore being cylindrical with a narrow powder chamber, whereby the effect of the powder gas was more concentrated, the walls of the piece stronger, and the projectile always in the same position.

The fifteenth century witnessed increased use of cannon and many changes. The improvements in shape continued, and there was constant striving to increase size. Bombards were made as large as 18 tons and fired stone projectiles as heavy as 900 pounds. Some were of 20-inch and even 25-inch bore. Some guns were in this century forged of iron in one piece—some

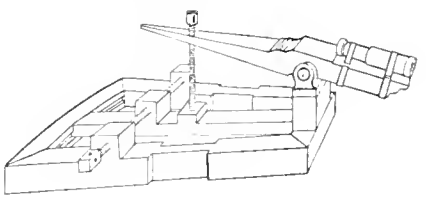


Fig. 1. Fifteenth-century gun and mount.

in several, separable for transportation. Framed carriages were made, some having the gun lashed to a hinged beam which could be altered in elevation. France, 1461 to 1483, made marked advances. Trunnions were introduced; stone projectiles gave way to cast iron, with improvement in carrying power and effect, due to greater density, which, however, increased pressures and forced a reduction in calibre and a thickening of the walls of the cannon. Brass casting was generally adopted for gun construction, while carriages were developed to move with troops.

At the beginning of the sixteenth century guns were generally of brass, but processes progressed sufficiently for them to be cast of iron. These were found to be too heavy for field use, and a return to the lighter brass was made for those requiring mobility, which rule held until the middle of the nineteenth century. Guns had handles and cascabels, and were much ornamented, and given individual names as well as complicated class designations, depending upon the size and proportion of length to calibre. During this century the field carriage limber was introduced. Case shot and explosive shell were used to some extent, but as the fuzes for the latter had to be lighted before insertion in the gun, many accidents occurred. Shell were first made of two hollow hemispheres fastened together. Guns were sometimes made of extreme length, as, for instance, 58 calibres. It was thought that the range increased with the length without limit.

To increase mobility, Gustavus Adolphus brought forth his 'leather gun' of thin copper wound with leather for strength, and afterwards used an iron 4-pounder weighing 650 pounds. Stationary carriages were made of wood supporting the gun by trunnions and resting upon wooden wheels. Elevating was done by wedges under the breech, and change in direction was given by moving the carriage bodily. The Dutch introduced the howitzer, a cannon reduced to such length that shell could be put into it by hand. Gustavus Adolphus, in addition to his gun, introduced the method of inserting the powder charge in a package or cartridge, thus avoiding the danger and loss of time due to ladling it into the gun.

In 1747 the French made the important discovery that, if the earth tamping about a shell were omitted, the discharge would ignite the shell fuze. This expedited loading, removed the great danger of shell fire, and increased its use. At this time field carriages were still crude, made of wood, with wooden axletrees, low limbers, and horses harnessed in tandem. Commencing about 1765 remarkable improvements were made in ordnance by Gribeauval. He had his guns cast solid and bored to accurate dimensions instead of being cast to approximate size. This diminished clearance, with the result of no loss of power, in spite of reduced length and weight. Trunnion-rim bases, removable copper vent pieces, and iron axletrees were introduced, and draught lightened by making the wheels of the limbers higher. An improved vertical 'pin tail' facilitated limbering and unlimbering. Heavy guns had traveling trunnion beds provided on the carriage to distribute their weight over the four wheels. The powder cartridge and projectile were fastened together. Aiming was facilitated by the elevating screw and tangent scale, and for moving the piece unlimbered the prolonge and bricoles were used. All parts were made of standard dimensions, so that spare parts could be taken into the field for repair. Carriages for heavy guns were greatly improved by the use of a pivoted chassis.

Hollow projectiles were much used. Grape (a number of shot in a net) were used until superseded by Gribeauval's canister (a thin can to hold a number of small shot and break up as soon as discharged from the gun). Near the end of the eighteenth century carronades became popular, especially at sea, and were much used. Being short, they were easily loaded, and at the ranges of that day their heavy projectiles with low velocity were very effective.

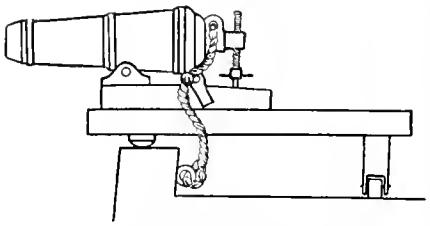


FIG. 2. CARRONADE (68-POUNDER) ON WOODEN NAVAL MOUNT. (Early nineteenth century.)

Early in the nineteenth century Colonel Bomford (United States) invented the 'columbiad' (q.v. for illustration), a gun of considerable length and having a long chamber, designed to fire at high velocity and low elevation either shot or shell. This idea was taken up abroad by General Paixhans (q.v.), of France, about 1822,

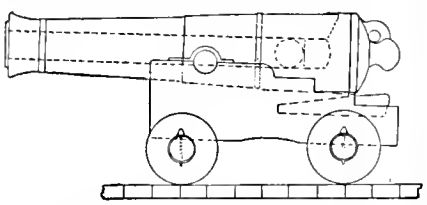


FIG. 3. ENGLISH 32 CWT. CAST-IRON SMOOTH-BORE 32-POUNDER, ON COMMON WOODEN SHIP CARRIAGE. (Early nineteenth century, but still in general use at sea in 1850.)

and 'Paixhans guns' came into very extensive use. They were important factors in rendering necessary the adoption of armor for ships. During the War of 1812 the most important guns in use were the columbiads and the carronades of the eighteenth century.

Admiral Dahlgren, United States Navy, in 1856, made the 'Dahlgren guns' for naval use of outline proportioned to the curve of pressures—therefore heavy at breech and light at muzzle. See GUNS, NAVAL.

RODMAN CAST-IRON GUNS. A casting cools and solidifies first on the surface, then progressively inward. The metal contracting as it solidifies draws inward from the solid outer shell, and the inner portion is thus put under tensile strain, while the outer is compressed by the reduction of its diameter. The effect of powder pressure in the bore is to strain the inner portion by tension. If now this inner shell be already under tensile strain, it is predisposed to rupture. General Rodman, Ordnance Department, United States Army, announced this condition, and proposed to avoid it by casting guns hollow and cooling them by water from the interior of the bore, while the exterior was kept hot by fire; the bore-surface then solidifying first would be compressed by the contraction of the outer layers, which would consequently be under tensile strain. The gun would therefore be stronger than a gun cast solid and cooled from the exterior, or even one without initial strain. Rodman's system of construction, used

in America and elsewhere for many years, gave the best results possible with cast iron, and was superseded only when the demand for rifles and higher power necessitated the use of stronger material. See ARTILLERY for illustration of Rodman gun.

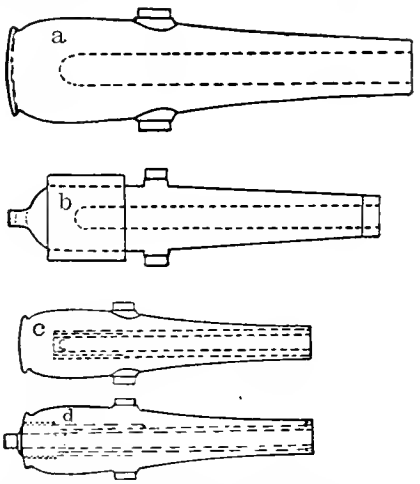


FIG. 4. NINETEENTH-CENTURY TYPES OF CANNON.
a, 15-inch Rodman cast iron. *b*, Parrott 300-pounder rifle. *c*, 10-inch cast-iron smoothbore converted to 8-inch rifle by 'muzzle-insertion.' *d*, Same as *c*, converted by 'breech-insertion.'

Chambers (United States) patented in 1849 a gun of wrought-iron tube with strengthening hoops. In 1855 Blakely (England) and Treadwell (United States) invented guns with hoops shrunk on. To them is due the real origination of the built-up system. Sir W. G. Armstrong (q.v.) of England made built-up guns for the English service from 1858. For many years his hoops were formed by coiling a rectangular bar of iron helically about a mandrel, and then closing and welding the coils together. These hoops were shrunk on the tube with initial tension. Whitworth guns were built up of cast and forged homogeneous steel hoops without shrinkage, the hoops being made slightly tapering and forced on by hydraulic pressure. The West Point Foundry (Parrott's) at Cold Spring, N. Y., to meet the demand for a cheap and quickly made rifle for use in the Civil War, made hollow cast-iron guns reinforced by a band of coiled wrought iron shrunk around the breech. These were the well-known 100-, 200-, and 300-pounder Parrott rifles, and served their purpose admirably, but the system was not capable of extension. Cast iron was, as always, unreliable.

The adoption of rifled guns, commencing about 1860, found all nations with large stocks of cast-iron smoothbores on their hands. Parsons (United States) in 1860 planned to convert these to rifles by inserting a steel tube through the breech and then closing that end by a permanent screw plug. Sir W. Palliser (England) in 1863 suggested a tube of coiled wrought iron inserted from the muzzle end of the gun. In the Palliser system the tube was prevented from forward motion by a collar screwed in front of it into the cast iron. Forward motion of Parsons's tube was prevented by several shoulders. This was the better method, as the tube was thus supported at several points with less danger of opening the welds between the coils. The Palliser system, which was cheaper, was adopted in England, and many guns converted by it. In America, between 1874 and 1880, many 10-inch guns were so converted into 8-inch rifles, comparing favorably with contemporaneous European rifles. Experiments were made in the conversion of larger calibre guns, in some of which the welds gave trouble, causing general distrust of muzzle-insertion, and the last 8-inch converted rifles had breech-inserted tubes. Variations of this conversion system were proposed for original construction, and several such guns were built and tested, notably the 12.25-inch rifle, between 1870 and 1880. Cast-iron bodies hooped with steel were strongly advocated by some, and the United States model 1886, 12-inch breech-loading mortars, made in this way, are now in service.

It was not until 1880 that the first really modern guns were commenced in the United States (by both navy and army), and commencement of regular manufacture was several years later. The establishment of the Army

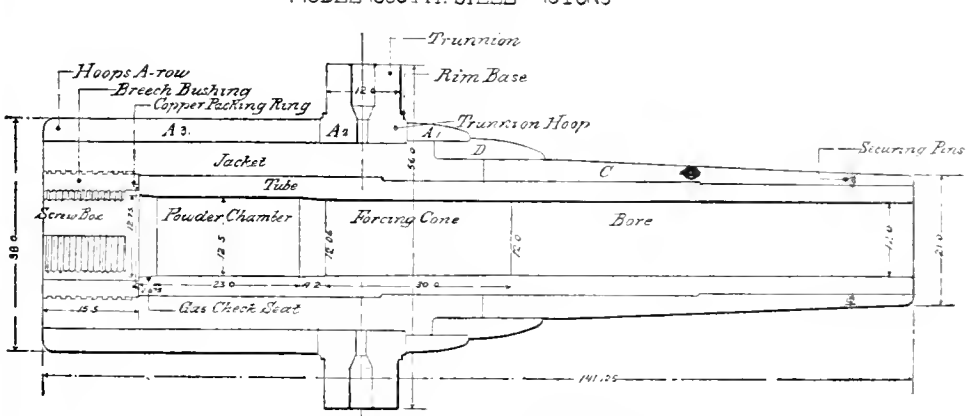


FIG. 5. 12-INCH BREECH-LOADING STEEL MORTAR,
Showing modern hooped construction, which is similar to that of guns, except in dimensions and details, arrangements, etc.

Gun Factory in 1889 may be regarded as the final commitment of the United States Government to the built-up forged-steel system. In 1890 the United States Navy had 6-inch, 8-inch, and 10-inch modern built-up guns in service; the army 8.2-inch guns and 12-inch mortars; both services had types of all calibres under test. Meanwhile elaborate calculations were being made in Europe, and reliable working formulas for the shrinkage deduced. By 1880 the system may be said to have been quite fully elaborated. Krupp in Germany, Armstrong in England, and Italy, the French, and others were then regularly turning out excellent built-up guns.

Wire-Wound Guns. In 1872 Dr. Woodbridge's design for a 10-inch muzzle-loading rifle made of a thin steel tube wrapped with wire brazed together by immersion in melted bronze was much recommended. The gun after 93 rounds was torn apart longitudinally by the force of discharge. It was evident that brazing could never be relied upon for longitudinal strength. Two other 10-inch guns upon the Woodbridge design were recommended in 1881 to be made and tried. One of cast iron with breech wrapped with wire was abandoned before completion. The second consisted of a steel tube the full length of the gun, the rear half being surrounded by longitudinal bars of steel, and the whole wrapped with steel wire at high tension, decreasing toward the exterior. The pressure upon the breech was transmitted through the longitudinal bars to the trunnions.

The Crozier wire-wound gun, commenced in 1889, consisted of a forged-steel tube wrapped over its whole length with tinned square steel wire and incased by cast-steel jacket and hoops, the jacket carrying the breech block and trunnions. All circumferential strength was to be obtained from the tube and wire. The tube was first wound at such tension as to compress it beyond its elastic limit and thus give it a special elastic limit, then unwound and wound again with the designed tension. The wire was continuously wound, the ends of the pieces as manufactured being electro-welded.

The first Brown segmental tube wire-wound gun was of 5 inch calibre, and had a very thin tube of high elastic-limit steel extending only from the breech to a short distance forward of the seat of the projectile, and forming a mere lining for the main tube, which was of longitudinal steel bars the length of the gun. This was wire-wrapped throughout with such high tension that even when powder pressure acts the tube is under compression. This is necessary to prevent the joints from opening, but necessitates the tube being initially compressed beyond its elastic limit, which is not desirable. In the latest development of the Brown system, not as yet fully tried, the segmental bars are replaced by thin plates radially and bent into epicycloidal forms by the wire winding. They extend from the breech to the muzzle, and are designed to give longitudinal strength and some tangential resistance from their frictional hold upon each other. A steel jacket connects the trunnions to the breech block.

Steel for Ordnance. Armstrong designed a steel tube for his built-up rifles of 1858, but was forced to abandon the idea after eight unsuccessful attempts to make one tube. In 1863 Sir Joseph Whitworth successfully made two steel guns, and by 1873 had perfected his fluid compression system for improving ingots, which led to renewed trials of steel for guns. Then and for some years the progress of gun-making was much hindered by efforts to cast guns of steel in one piece. Since 1890, however, steel has been universally used for guns.

Breech-Loading Systems. Of the breech-loading systems in use to-day nearly all can

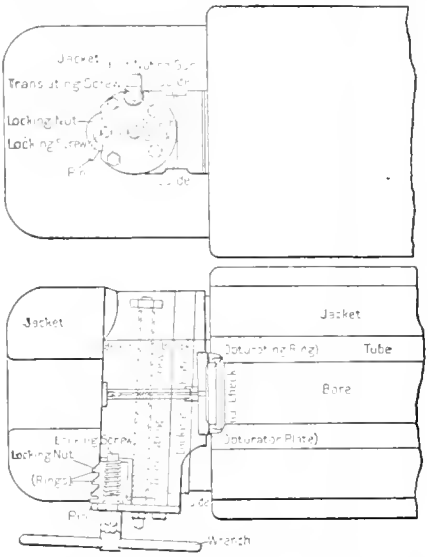


Fig. 6. Krupp breech mechanism.

The upper figure shows a vertical view of the breech of a Krupp gun. The breech block, which is wedge-shaped and has its axis not perpendicular, but oblique to the axis of the gun, moves transversely as shown in the lower diagram, a horizontal section, and when moved to the right by the rotation of the translating screw allows the projectile and charge to be inserted in the gun by bringing an open portion of the block in line with the bore. To close the breech the translating screw, which has a quick pitch and works in a half nut on the gun jacket, is turned. This moves the breech block so that the solid part comes in front of the bore, but does not, however, lock the breech or force the gas check into its place. This is accomplished by the locking screw and accompanying mechanism, which forces the block forward and secures it firmly.

be classified under either the transversely sliding block system, of which Krupp's is the most important, or the longitudinal screw-block sys-

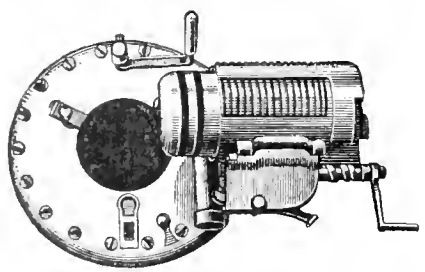


Fig. 7. Breech mechanism (interrupted screw) of U. S. A. 8-, 10-, and 12-inch breech-loading rifles, model 1888.

Breech open, showing tray, double-threaded translating screw, block spindle, gas check, pad, and latch.

tem, of which the United States service types are prominent examples. In 1858 Armstrong's 32-pounder rifled breech-loading guns introduced

into the English Navy had a transverse block supported by a longitudinal screw block bored out to permit loading when the transverse block was removed. About the same time Krupp had a breech-loading system of transversely sliding wedge-shaped block, essentially his present system. In 1849 Chambers (United States) patented

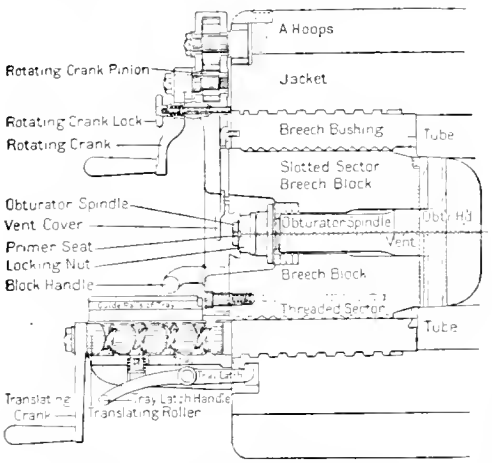


FIG. 8. SECTION BREECH MECHANISM OF U. S. 12-INCH BREECH-LOADING MORTAR, MODEL 1890, MARK I.

a longitudinal screw block with interruptions in the threads that permitted it to be slid to the rear after only a partial rotation. This is the present American system. The French developed the idea in their naval and land service in 1870, calling it the Reffye mechanism.

Both the Krupp and the French breech-loading systems, as well as many others, were tried in the United States before the final adoption of a modification of the French system. In the earlier guns much difficulty was experienced with gas checks; Krupp used a ring of steel, the thin edges of which pressed by the gas prevented escape; the De Bange check used by the French was a plastic pad of asbestos flour and tallow, held in a canvas bag which, being pressed back by a spindle receiving the powder pressure, was spread sidewise tightly against the walls of the bore, sealing the joint. (See illustration under GUNS, NAVAL.) Finally A. H. Gerdom designed steel split rings, one in front and one behind the pad, to act themselves as gas checks, the function of the pad being simply to press upon their beveled inner surfaces and wedge them outward. This gas check is now in successful use, and constitutes one of the most important of the American improvements of the system.

In its latest development, the breech mechanism for heavy guns is operated by a continuous rotation of a single crank in one direction, which, by means of a combined spiral and spur gear, first rotates the block to bring the threaded sectors opposite the open ones of the gun, then draws the block to the rear clear of the gun, and finally swings it to one side on a tray hinged to the gun. These three motions are always

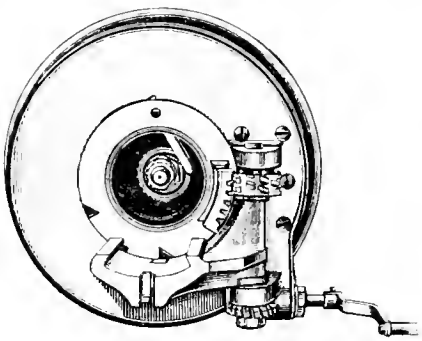


FIG. 9. BREECH MECHANISM (INTERRUPTED SCREW) OF 12-INCH BREECH-LOADING RIFLE, MODEL 1895.

Differs from that of model 1888 by device for opening by continued turning of crank. Breech closed and locked.

necessary to the withdrawal of the interrupted screw block. In guns of 6-inch calibre and less, they are accomplished by a single quick motion of a crank connected by links, gears, or otherwise, to the block so as to accomplish the rotation, withdrawal, and swinging successively and automatically. A very recent adaptation of the screw block is the Nordenfelt eccentric block, which is not withdrawn at all, but being rotated about a centre not in the axis of the gun, a hole in the block can be brought opposite the bore for loading, or the bore may be closed by the solid part of the block, while the block is at all times held by circular grooves and cuts in its housing. Great attention has been paid to locking the block of all systems, and to devices for preventing fire before this locking is complete.

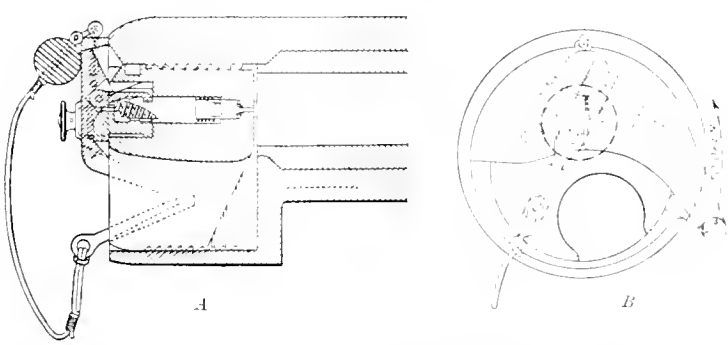


FIG. 10. NORDENFELT ECCENTRIC BLOCK BREECH MECHANISM FOR RAPID-FIRE GUNS. A, Longitudinal vertical section. B, Section through breech.

SIZE AND POWER OF GUNS. By 1880 the introduction of large-grain slow-burning powder and of heavier projectiles had much increased the power of guns in proportion to calibre. At that time the English had guns weighing about 100 tons, of 17.72-inch bore, firing a 2000 pound projectile, with 1640 feet per second velocity. In the United States, to keep pace with this movement, a 16-inch gun was designed, to weigh

127 tons, and to fire a 2400-pound projectile, with a velocity of 2300 feet per second. This gun, when finished, was the most powerful ever built. The time elapsed since its design has, however, seen a reaction of opinion adverse to the construction of guns above 12-inch calibre, and the experience of several recent wars, meagre as it has been, has led to a strong sentiment in favor of a limit even lower.

Principles of Design. A gun has to withstand three kinds of stress: (1) A pressure radially outward; (2) a force tending to stretch the gun longitudinally; (3) transverse stress due to the weight of the parts of the gun on opposite sides of the point of support. The first, tending to enlarge the bore, stretches the metal circumferentially, and on account of the resistance of the outer layers compresses the inner parts radially. The powder pressure is at a maximum before the projectile has moved more than a few inches—due to sudden evolution of gas, restricted space, and resistance of rifling—and quickly falls as the projectile moves forward. When the size of the interior of the gun and the conditions of loading are determined, the intensity of the pressure to be expected at each point along the bore is calculated and a pressure curve plotted. The way is now clear for the design of the gun as an engineering structure to withstand these known forces at the various points. The tube of a built-up gun is strengthened by putting over it hot hoops, which when cool are of less diameter than the tube's exterior by an amount called the 'shrinkage.' The shrinkages are so calculated that at no time shall any portion of the metal be strained beyond its elastic limit, and that in case of accidental high pressures bringing the gun up to its limiting strength all the component cylinders would reach their elastic limits simultaneously. Thus it is necessary to calculate the shrinkage and strength under the assumption that the maximum powder pressure is acting, and again that no interior pressure is acting; i.e. the 'system at rest.'

Construction of Built-up Steel Cannon. The material of which modern guns are made is 'low steel' containing about one half of one per cent. of carbon. In the United States it is made by the open hearth process. (See Iron and Steel, Metallurgy of.) In Germany crucible steel is used. Bessemer steel is practically debarred, because it is not pure or sound enough for use in cannon. The steel is cast into ingots roughly approximating in shape the pieces to be made from them, but larger. United States Army specifications require about 30 per cent. at top and 6 per cent. at bottom of the ingot to be discarded. The metal is generally compressed by Whitworth's fluid compression.

After the ingot is cast, it is cooled very slowly to avoid strains, and then the surplus portions are cut off and specimens taken for chemical analysis and tensile test. The balance of the ingot is now bored in a lathe, then heated and forged on a mandrel.

After forging, the specifications require that the strains due to this operation be removed by annealing. The forging is then turned and bored in a lathe to nearly its finished size and specimens taken for test. It is then oil tempered to give toughness, but this process is apt to induce strains in the metal, to remove which the forging is generally required to be again annealed. Tubes are bored in a lathe with a long boring bar fed into the tube, which rotates while the bar remains stationary. The tool carried at the end of the bar is a 'hog-nose' or semi-cylinder of cast iron, which, by its pressure on the bore, already cut, steadies and supports a cutting tool at its forward end. The bore thus produced is straight (within a small fraction of an inch in the whole length of the tube), but rough, and is smoothed by a reamer, a cylinder of wood fitting the bore tightly and carrying long side cutters. During or after the boring, the outside of the tube is turned to diameters greater by the calculated shrinkages (about 0.0003 of the diameter) than the inner diameter of the hoop to encircle it. (The operations upon jackets and hoops are in general similar to those upon tubes.)

When ready for assemblage the hoop or jacket to be put on is heated in an oven (generally in a vertical position, in an oil furnace, to 500 to 800 degrees F.), and expanded to 0.03 inch to 0.08 inch larger diameter than the part it is to surround. It is then lowered over the latter, which stands in a vertical position, until it abuts against a shoulder on the tube. In order that it shall not in cooling grip the gun higher and draw away from this shoulder, water is poured on to the hot hoop near the joint to cool it there first, and then the water ring is gradually moved up to produce progressive cooling through the whole length of the hoop. The gun, as it begins to be called as soon as any pieces have been assembled on the tube, then goes to a lathe to have the surface turned for the next hoops to be shrunk on.

The sequence of assemblage of the jacket and the hoops is dependent upon the system used to transfer the longitudinal forces to the trunnion. In mortars generally, and in some guns, the tube is run through the jacket from the rear until its shoulder abuts against one in the jacket. In most 8-inch, 10-inch, and 12-inch United States guns the 'C' hoops (covering the chase or muzzle portion) are first put on from the front of the tube, then the jacket is put on from the rear. This leaves both jacket and hoops held from sliding off the ends of the tube by their grip only. The grip is very great, but is not regarded as sufficient security, and an 'L' hoop, or locking hoop, is put on, having a portion of its bore near the centre of greater diameter than the bores at each end. This portion corresponds to a raised shoulder on the forward end of the jacket and one on the rear of the first 'C' hoop, thus binding them together. The 'L' hoop is expanded sufficiently to allow its smaller diameters to pass over these raised shoulders in assemblage. The trunnions are forged solid with the trunnion hoop, which is assembled upon the gun by shrinkage like any other hoop. When all hoops have been assembled, the gun, after a careful inspection for dimensions and straightness, is finish-bored to its proper calibre, turned to the prescribed shape outside, rifled, and the powder chamber, forcing slope, and breech recess finished.

Rifling is done by pushing in from the muzzle a bar, carrying a planer tool to cut the grooves, and so rotated by rack-and-pinion and a forming bar, or by a guide-pin and groove in the bar, as to make the groove of the prescribed twist. The curve of the rifling, to reduce resistance at first,

increases from one turn in 50 calibres, at the commencement, to one turn in 25 calibres, at the muzzle (the United States standard), and is, when developed on a plane surface, a semi-cubic parabola. The forming bar referred to, being set to that curve as calculated for the particular gun, guides a straight bar, perpendicular to the rifling bar, in such a manner that by means of its rack and the rifling bar's pinion the proper rotation is imparted to the tool.

The powder chamber is in rear of the rifled part of the gun, and is of slightly larger diameter to hold more powder in a given length, and to allow for a narrowing cone at its front end to stop the projectile in the right position and bring it to a central position. Forward of this cone is the rifling, but, to prevent excessive pressures due to instantaneously overcoming the whole resistance of the rotating band to taking the rifling, it is customary to ream off about half of the depth of the lands (or ridges of metal between the rifling grooves) at this point, and this reaming is done in the form of a cone several feet long, so that the increase in height of the lands shall be gradual throughout this distance. The breech recess is the part in rear of the tube which is threaded and slotted for the breech block.

Each gun is required in the United States (and all nations have similar requirements) to be fired at least five rounds before it is issued for use in fortifications. Before the adoption of a new type of gun, one gun of this type must have withstood 500 rounds.

In the manufacture of wire-wound guns the tube must be machined as for the built-up gun, and is wound by rotating it in a lathe while the wire is fed from spools through a machine, giving the wire the tension calculated therefor. Whatever jacket and hoops are to be used in the design are shrunk on exactly as in built-up guns.

Classes of Cannon. Cannon are classified as guns, howitzers, and mortars. Guns fire at high velocity and therefore low elevation, about 12° being the maximum; howitzers, shorter than guns of same calibre, have lower velocity, and therefore, range for range, higher angles of elevation, generally up to 20°; mortars, still shorter in proportion, fire at still lower velocities and at 45° to 60° elevation.

Another classification of cannon, depending upon their use, whether for field, siege, or seacoast purposes, involves no essential differences in the guns themselves, other than the limits of weights imposed by the required mobility. (See Field Artillery; Siege Gun; and Coast Artillery.) Yet another classification of cannon, depending upon their mode of operation and service, differentiates between the ordinary breech mechanism with separate loading of projectile, charge, and primer, and the rapid-fire (or quick-fire) gun, semi-automatic, automatic, and machine gun. The rapid-fire gun is one with a breech mechanism opened and closed by a single motion of a lever and loaded with fixed ammunition—projectile, charge, and primer fixed in a metal case, so that all can be inserted at one motion. (They will be found described under Rapid-Fire Guns.) Semi-automatic guns are those rapid-fire guns in which the energy of recoil is utilized to open the breech, reload, and cock—each round being, however, inserted by hand and the trigger pulled for each discharge. Automatic guns are those in which the above utilization of recoil is extended to all operations, the cartridges being fed automatically in strips or belts, or otherwise, and the gun firing round after round automatically as long as a trigger is pressed.

Machine guns include all guns in which the action is as described for automatic guns, whether the power for operation is derived from the recoil as above, and as exemplified in the Maxim, Colt, and Hotchkiss automatic guns, or is supplied by a cannoneer or motor continuously turning a crank as in the Gatling machine gun and the Hotchkiss revolving cannon. They will be found treated under Machine Gun.

At one time much was promised for guns in which compressed air was employed to throw large quantities of dynamite or other high explosive relatively short distances. A pneumatic dynamite gun for coast defence was invented by Captain E. L. Zalinski, U. S. A., and after a number of experiments several of these guns were constructed and installed in fortifications in the United States, but these have since been removed as obsolete. These guns were smoothbore, the largest having a tube 50 feet in length and a calibre of 15 inches. Compressed air derived from a compression plant located near by and stored in reservoirs so that it could be used in the gun at a pressure of 1000 pounds to the square inch was employed. A range of about 5000 yards was attained with the 15-inch guns and projectiles containing 100 pounds of high explosives. The Zalinski gun has also been used at sea, the dynamite cruiser *Vesurius* having been constructed with three tubes, and was employed at Santiago, but without the success anticipated. Another form of pneumatic gun is the Sims-Dudley gun, in which a projectile containing a charge of about four pounds of high explosives is fired by air compressed by the explosion of gunpowder in a lower barrel. This gun was used with some success during the Spanish-American War. See Air Gun.

The distinctions between smoothbores and rifles, and between muzzle-loaders and breech-loaders, are obvious; all modern guns are breech-loading and rifles, but it is customary to designate them as 'breech-loading rifles' (B.L.R.) to avoid confusion with the obsolete guns still in existence.

Carriages. Gun carriages are either stationary (as seacoast) or mobile (siege and field); as to mode of action, barbette, disappearing, turret or casemate, or motor carriages, or rapid-fire mounts (recoil and non-recoil). The main function of a gun carriage is to support the gun during firing; secondly, means must be provided for pointing the gun. Mobile carriages must also possess the attributes of vehicles.

Modern seacoast carriages have a cast-iron base ring, solidly set in concrete, an iron or steel turntable or racer upon this, and the chassis assembled thereon. Generally a top carriage of some sort runs back on rails on the chassis, its motion in recoil controlled by a brake, generally hydraulic. Such a brake consists of a cylinder fastened to the top carriage, which contains a piston fastened to the chassis. Oil in the cylinder can pass the piston, as the cylinder moves to the rear, only through small orifices in the piston varying in size during recoil.

The first step in design is to construct a curve showing the velocity the gun would have if left free to recoil with no resistance but its own inertia. A certain constant resistance is now fixed upon for the brake, and the resulting velocity of retarded recoil is plotted. From this the opening in the piston, varying with the distance recoiled, to give the desired constant resistance, is calculated—resistance to flow through

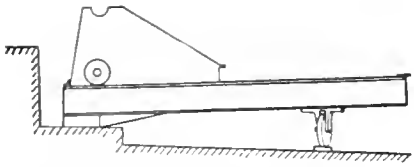


FIG. 11. U. S. IRON SEA COAST BARBETTE CARRIAGE FOR RODMAN SMOOTHBORE.
(In use up to 1875 and later modified for 8-inch converted rifle.)

an orifice being known to vary inversely as the square of the velocity. Thus the constant pull transmitted to the chassis by the piston rods, and hence the stresses borne by all parts, are determined and used to calculate their dimensions.

Prior to the adoption of the hydraulic brake various means of checking recoil were used. Up to about 1850 the friction of wooden wheels and axles was used with a rope for final stop. About 1860 naval carriages were made of iron and had no rear wheels but a shoe (for friction). The front wheels helped in returning the gun to battery. On land heavy carriages had I-beam chassis, and top carriages like the above. Friction of top carriage on chassis rails as well as the inclination checked recoil. Eccentric axles allowed recoil on friction and return on rollers. As the power of guns increased, recoil had to be further controlled. Between 1870 and 1880 various frictional devices were used. One or more bands of iron fastened to chassis were gripped by plates on top carriages pressed tightly on them.

The earliest hydraulic cylinders (about 1876) had pistons either pulled out or pushed in by recoil, the oil flowing around the piston in the clearance. Sir W. Siemens introduced holes in the piston head. So far, the orifice being constant, the pressure varied, running up to high values, then decreasing. To obtain constant pressure (to do the same work with less maximum strain) the orifices came to be varied, by taper rods passing through them, by rotating disks partially closing them, by by-pass pipes with spring valves and by other methods, among which are the 'throttling bars' used in the United States carriages. Here the piston has notches in its circumference partly closed by bars of varying depth screwed to the cylinder. As the piston travels in the cylinder the orifices change with the depth of the bars.

Top carriages now recoil on rollers to eliminate as much as possible the uncertain effect of sliding friction.

Return to firing position is accomplished by gravity, springs, or pneumatic or air power.

For giving elevation, guns are generally rotated about their trunnions (at or near the centre of gravity) by a screw, rack-and-pinion, or similar device at the breech. In rapid-fire mounts the principle is the same although elevation is generally given to a cradle or slide in which the gun's axis is fixed. In field guns, to economize space, the motion is doubled by having one screw work inside of another.

For traversing, the early carriages were pried bodily sidewise by levers; then the chassis was pivoted and rotated by ropes and pulleys or later by gearing of one kind or another. Still later the chassis was fixed upon a turntable rotated by a pinion working in a circular rack in the foundation and operated by gearing.

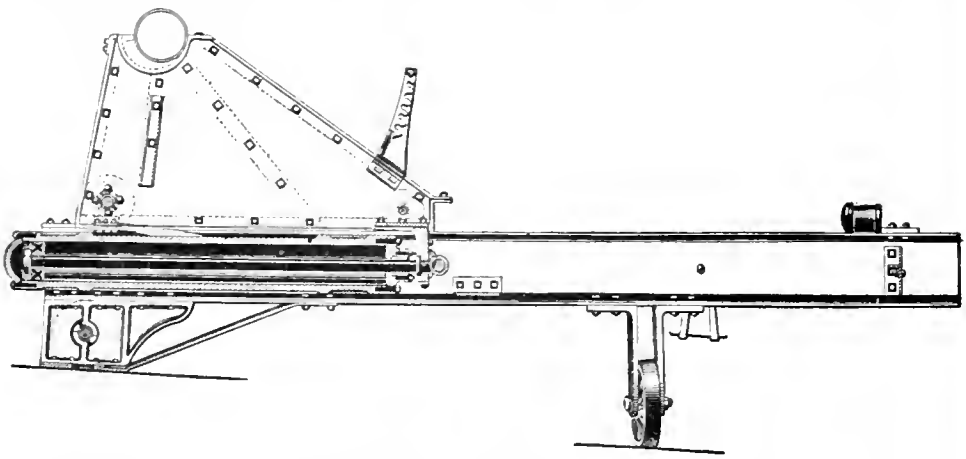
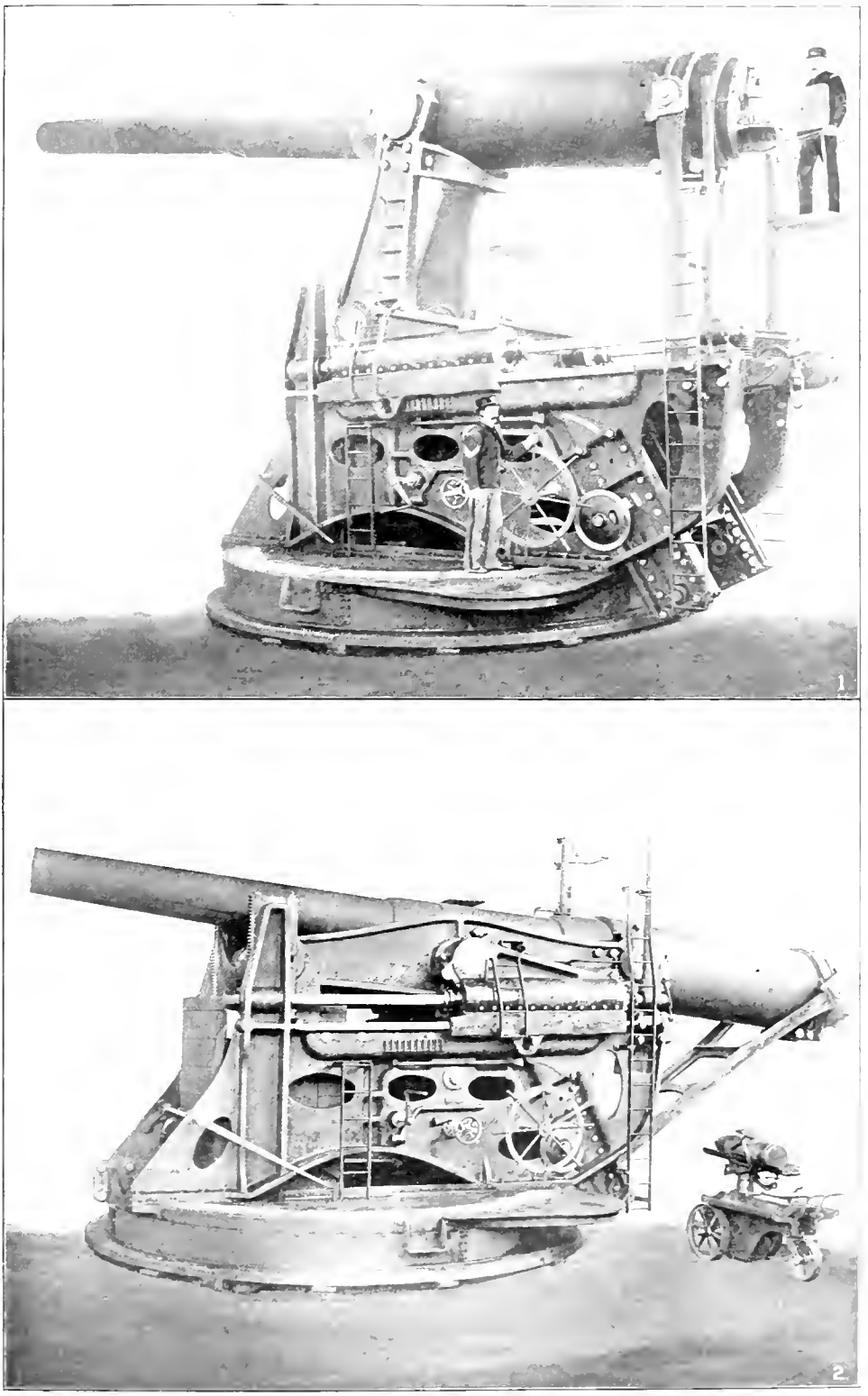


FIG. 12. U. S. IRON BARBETTE CARRIAGE FOR 8-INCH RIFLE.
Altered from carriage for 8-inch smoothbore, and used for the 8-inch converted muzzle-loading rifles. This carriage has eccentric wheels traveling on the chassis and a hydraulic recoil brake.

In barbette carriages the gun is generally mounted on trunnions directly in the top carriage, which slides to the rear (restrained by a hydraulic brake) on the chassis rails. These incline upward slightly, to make the gun run into battery again. This type is mostly used in land forts for heavy guns. See illustration of 8-inch Breech-loading Rifle on Plate of COAST ARTILLERY.

The essential feature of carriages for use in casements or turrets is that the opening in the wall or armor necessary for them to



U. S. ARMY DISAPPEARING CARRIAGE, MODEL 1895, FOR 12-INCH BREECH-LOADING RIFLE. Buffington-Crozier Design.
1. In firing position. 2. In loading position.

fire through with the desired horizontal and vertical angles of train shall be as small as possible. The former was provided for up to very recent time by placing the pintle or point of revolution at the front end of the carriage, or even in the wall, and connected with the carriage by a metal rod called the tongue. In turrets, land or naval, it is customary to rotate the turret, gun and all, and thus eliminate all horizontal movement of the gun with respect to the opening or embrasure. To reduce the embrasure vertically the gun is lifted or lowered by two hydraulic presses, or other power, the muzzle being stationary. The necessity for such carriages for land service has decreased with the abandonment of masonry forts, but exists in naval mounts, whether in turrets or not, and in land turrets (as yet few in use).

Disappearing Carriages. In the United States disappearing carriage for seacoast guns (the Crozier-Buffington) the gun's trunnions rest in the upper ends of two levers which have an axle at their centres resting in a top carriage and pins at their lower ends supporting a counterweight in vertical guides. The motion of the gun's trunnions in recoil is a resultant of the horizontal motion of the gun-levers' centre and the vertical motion of their lower ends—therefore an ellipse. The breech is held up at the proper height by a rod pivoted at bottom in a slide raised or lowered to change elevation. In recoil, therefore, the breech moves in a circular arc. The gun's muzzle moves to the rear almost horizontally until it clears the parapet—then sharply downward. In the loading position, the breech (the most exposed part) is protected from fire over the parapet of less than 7° angle of fall. The motion of the top carriage is controlled by a constant resistance hydraulic brake. The recoil is also somewhat absorbed by raising the counterweight, but this is incidental, as the counterweight's function is simply to return the gun to the firing position. Pawls catch on teeth on the counterweight crosshead holding the gun in the recoiled position for loading until released by a lever. Entirely protected from the enemy's fire, the cannoneers load the gun and traverse and elevate by means of hand cranks or electric motors. This may be directed from a distance by telephone, or by one man on the sighting platform—the only one exposed to fire—who, in the later models of carriages, can himself perform the training by electric controllers within reach. This carriage was invented in principle by Gen. A. R. Buffington in 1872, and developed into the present form, about 1890, by Gen. William Crozier (both of the Ordnance Department, United States Army).

The only other disappearing carriage of any importance now in use is the English Elswick carriage, in which the gun levers have fixed pivots at their lower ends and are controlled in rotation by a rod from their centres carrying at its lower end the piston of the hydro-pneumatic cylinder, which by oil-flow softens recoil, and by air-compression stores up energy to return the gun to the firing position.

Mortar Carriages. Mortar carriages have the turntable and chassis as in the preceding, but no top carriage. As they are for high angle fire and recoil necessarily downward, springs are necessary for return to firing position. In the United States model of 1896 the mortar rests on the end of a lever pivoted at its bottom to the turntable and with spring columns and hydraulic buffer beneath. Previous to the adoption of such types as these mortar carriages had been simple iron boxes with trunnion beds. See Plates of Coast Artillery and Artillery.

Rapid-Fire Mounts. Rapid-fire mounts are a development of the last twenty years. They are either recoil or non-recoil. Applied first to small guns (as one-pounders and three-pounders), no recoil was allowed, the mount being made strong enough to transmit the shock of discharge to the deck, which, however, could not stand the shock due to large calibres when so mounted. A non-recoil mount for six-pounders reduces the shock on the deck to about one-sixth. There are other advantages. So recoil mounts are now almost universally used, even for small guns. Such a mount consists of the pedestal bolted to deck or platform, a Y-shaped yoke rotating about a vertical axis in the pedestal and in its upper arms carrying upon trunnions a cradle in which the gun has longitudinal motion. In the under portion of the cradle is the cylinder of a hydraulic brake and either in this cylinder or beside it are spiral spring columns.

Training is done in the small-calibred guns by a shoulder bar with rubber cushion, fastened in non-recoil mounts to the gun or yoke, in recoil mounts to the yoke or cradle. With his shoulder against this bar the gunner points the gun in direction and in elevation almost as a small arm. In guns of over 3-inch calibre it is customary to train by hand wheels within easy reach of the gunner.

Balanced pillar mounts are rapid-fire mounts like the above, but mounted on a vertical cylinder which is balanced by a counterweight and can, when not in action, be lowered to mask the gun and carriage completely behind the parapet.

Mobile Carriages. Carriages for field guns and howitzers and for siege guns and howitzers differ in detail and size, while the same in principle. Siege carriages are generally high enough to fire over a five-foot or six-foot parapet, and much heavier than field carriages because of the greater energy of recoil and because they do not require so great mobility. They weigh about 5500 pounds, with limber, while field carriages are limited to 4000 pounds, including limber, and three cannoneers and 700 pounds or more of ammunition.

Mortars for field and siege use are generally fired from immobile carriages and transported on wagons. Siege carriages generally require platforms to which they are attached to assist in control of recoil.

A carriage, field or siege, must have two wheels with axletree and a trail giving a third point of support on the ground when firing. The trail also connects with the limber for traveling. Until recently trunnion beds were formed in the front ends of the sides or flasks of the trail and the gun had no recoil relative to the carriage, which ran back on the ground until the energy was absorbed by friction of brake and resistance of ground.

Up to the United States Civil War all mobile carriages were made mostly of wood, although with metal bracings, axletrees, and other parts. At this time iron was recognized as the coming material and was soon adopted. Since 1880 all carriages have been made of iron or steel, now al-

most entirely of the latter. Earlier iron carriages had flasks of plates and angles. The Buffington carriage (United States), of steel pressed with bulb edges, has been in use from 1888 to the present time.

braking and helical springs for returning the gun to the firing position. The carriage is so stable that cannoneers sit on the trail, aiming, etc., during firing. This is the result of careful calculation of the forces in equilibrium during

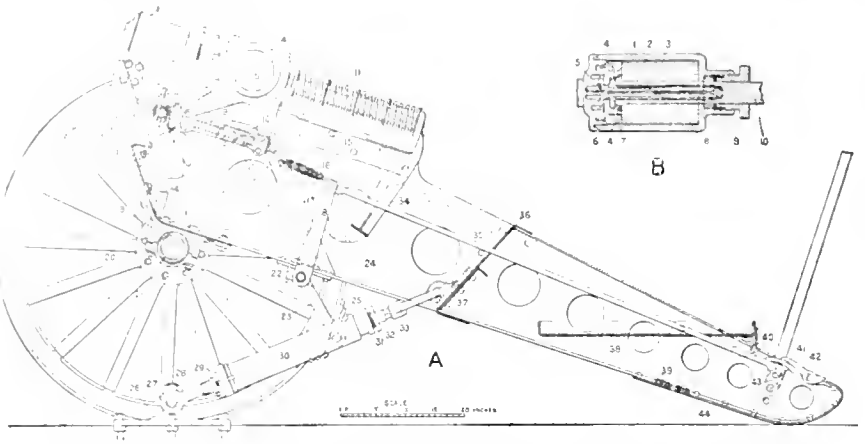


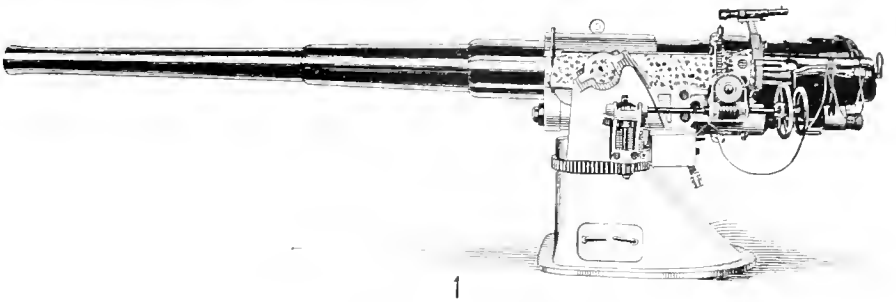
FIG. 13. SEVEN-INCH SIEGE HOWITZER CARRIAGE, UNITED STATES ARMY MODEL, 1899.

A, (Vertical section). 1, recoil cylinder; 2, gland for recoil cylinder; 3, piston; 4, cap-square; 5, trunnion carriage; 6, elevating rod; 7, elevating nuttres; 8, equalizing pipe; 9, worm buffer; 10, elevating worm; 11, recoil springs; 12, elevating wheel; 13, front transom; 14, hand-spike, etc., socket; 15, slide rail; 16, brake spring; 17, flask stiffener; 18, brake shaft lever; 19, axle bracket; 20, axle bracket-cap; 21, axle; 22, brake-shaft bearing; 23, brake shaft; 24, flask; 25, brake shoe; 26, pintle plate; 27, 29, cylinder head; 28, pintle nut; 30, brake cylinder; 31, gland; 32, piston; 33, piston eye; 34, stop transom; 35, reach rod; 36, carriage brake transom; 37, brake fastener; 38, foot plate; 39, lunette reinforce; 40, tool chest lock; 41, brake lever socket; 42, brake catch pawl; 43, brake rod crank; 44, trail shoe. B, Recoil cylinder (horizontal section). 1, recoil cylinder; 2, piston; 3, throttling rod; 4, oil passage; 5, front cap; 6, piston; 7, piston liner; 8, follower; 9, gland; 10, piston.

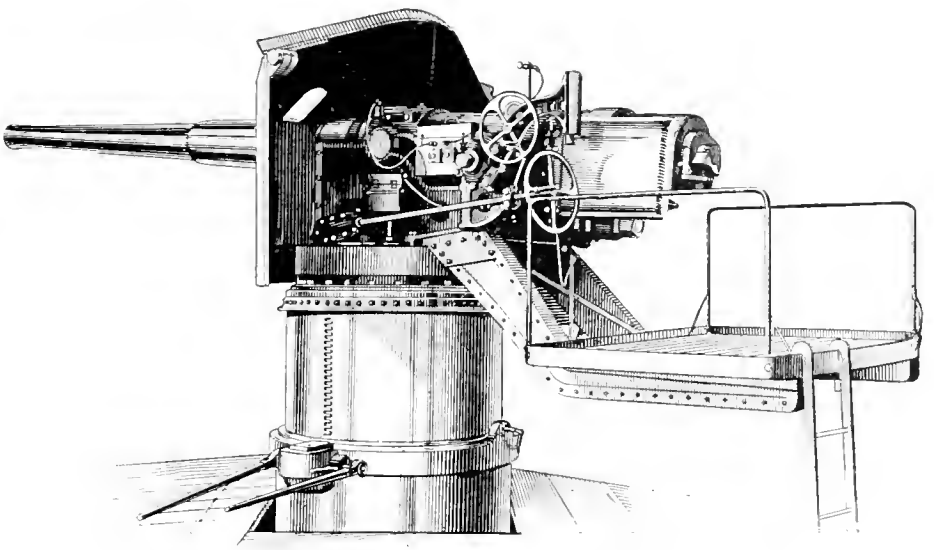
To enable carriages to stand guns of increased power without undue recoil, brakes were devised, set by recoil, and released by running forward. Later, spades were introduced. When power increased so as to work the spade too hard, a short recoil was given the piece upon the carriage, this being first applied to siege, and later to field carriages. This enabled the spade to hold, but resulted in the wheels of the carriage jumping from six to twelve inches from the ground with derangement of aim and loss of rapidity of fire. In the last few years rapidity has been much discussed and sought for in ideal rapid-fire field guns to fire about twenty aimed shots per minute. This result has been nearly attained in a number of recent constructions.

Such a system requires a carriage unmoved by discharge (necessitating about 45-inch recoil of the piece upon it, with automatic return to firing position—quick, but without shock—and a spade to take sure hold of earth); also means for traversing the gun on the carriage and for elevating by cranks within reach of one man at the sights. The Ehrhardt carriage (adopted by England) has the gun on a slide under which is a hydraulic brake or cylinder surrounded by a helical spring. Its trail can be extended for stability. Krupp uses a similar arrangement for recoil springs. The United States conducted in 1902 experiments for election of a type; testing two carriages made by the Bethlehem Steel Company, one by the Cockerill Company, one by the Vickers-Maxim Company, and several others, including two Ordnance Department designs by Captain Wheeler, one with 8-inch and the other with 46-inch recoil, have been submitted. In the latter the gun recoils through a bronze cradle which holds two cylinders containing oil for discharge. To prevent jump, the moment of the pull on the piston rod about the spade must not exceed that of the weights about the same point. The guns selected embraced the best points of the Ehrhardt gun, with the improvements and original features of the United States Ordnance Department's models. All parts must be reduced to minimum weight needed for strength, to keep within the limit of weight allowed for draught. See FIELD ARTILLERY.

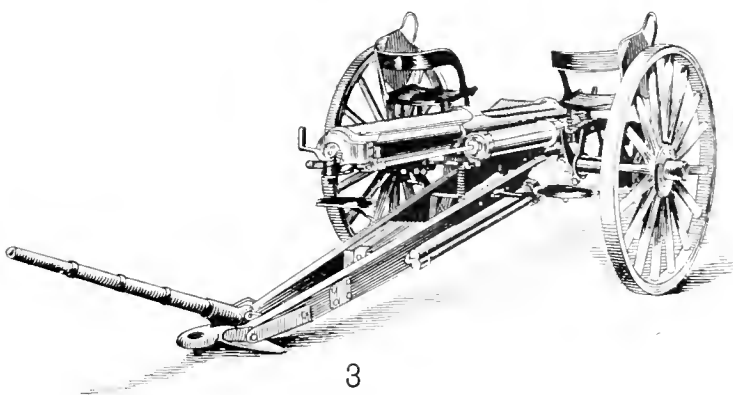
BIBLIOGRAPHY. Of the many publications on ordnance matters, the reader is referred to the following few as comprehensive and most accessible, viz.: Bruff, *Ordnance and Gunnery* (New York, 1896); Ingersoll, *Text-book of Ordnance and Gunnery* (United States Naval Academy, 1887, used in the United States Military and Naval academies); *Annual Reports of the Chiefs of Ordnance, United States Army and Navy* (Washington); *Treatise on Military Carriages*, English War Office (London, 1895); *Treatise on Service Ordnance*, English War Office (ib., 1891). Also numerous official pamphlets and books of instruction, issued by the United States and foreign war departments, advertising matter of private firms, especially Armstrong and Hotchkiss, and the numerous technical periodicals. *Mittheilungen über Gegenstände des Artillerie- und Genie-Wesens* (Vienna, bimonthly); *Militär-Wochenblatt* (Berlin, semi-weekly); *Revue d'Artillerie* (Paris, monthly); *Revue Militaire Suisse* (Lausanne, monthly); *Revue de l'Armée Belge* (Brussels, bimonthly); *Journal of the United States Artillery* (Fort Monroe), etc. See ARTILLERY; GUNS, NAVAL; GUNPOWDER; EXPLOSIVES; MACHINE GUN; PROJECTILES; RAPID FIRE GUNS; SIEGE GUN; COAST ARTILLERY; etc.



1



2



3

1. Four-inch Rapid-fire Gun 50 calibres long on U. S. Navy Pedestal Mount, 1901.
2. Balanced Pillar Mount for 5-inch Rapid-fire gun, model in use U. S. Army, 1902.
3. U. S. Army Ordnance Department 3-inch Rapid-fire field gun, long recoil carriage, designed by Capt. C. B. Wheeler. Gun shown partially recoiled on carriage, due to discharge.

ORDNANCE DEPARTMENT OF THE U. S. ARMY. One of the divisions of the United States Army, to which is assigned the duty of procuring by purchase or manufacture the ordnance and ordnance supplies required by the army and distributing the same. Accordingly the establishment and maintenance of arsenals, armories, and depots for the manufacture and storage of ordnance are assigned to this department. The regulations define ordnance and ordnance stores as including cannon and artillery carriages and equipments; apparatus and machines for the service and manœuvre of artillery; small arms, ammunition, and accoutrements; horse equipments and harness for the artillery; tools, machinery, and materials for the ordnance service. This department is under a Chief of Ordnance, who has the rank of brigadier-general while serving in this capacity, and in 1903 there were four colonels, six lieutenant-colonels, twelve majors, twenty-four captains, twenty-four first lieutenants, one ordnance storekeeper with the rank of major, and 110 ordnance sergeants. Previous to the Army Bill of 1901, the officers in the Ordnance Department held permanent appointments, but this act provided that line officers should be detailed to the Ordnance Department by the President for a period of four years. Before an officer can be so assigned he must first pass a rigorous examination in which his professional qualifications are thoroughly tested. The officers, in addition to a thorough scientific military training, must possess a thorough knowledge of mechanical engineering in general and especially in its application to the various engines of war. This department has always maintained a high standard and many important inventions have been made by its members. In fact, the larger and more important guns constructed in the United States have been designed and constructed by the officers of this department at army arsenals instead of at the shops of private corporations, as is the case in most European countries. See ORDNANCE; ORDNANCE ESTABLISHMENTS.

ORDNANCE ESTABLISHMENTS. The United States maintains two Government gun factories, one at Watervliet, N. Y., for the army, and one at the Navy Yard, Washington, D. C., for the naval guns. Carriages for naval guns are made at Washington Navy Yard, and those for the army at the Watertown Arsenal, Watertown, Mass., and Rock Island (Ill.) Arsenal. Small arms for the army and navy are made at the Army Armory at Springfield, Mass., and ammunition therefor at Frankford Arsenal, near Philadelphia, Pa. The last mentioned arsenal makes also all fuzes, primers, sights, etc. Rock Island Arsenal, above mentioned, makes, in addition to mobile gun carriages, harness and other equipments used in the army. Material of war is fired and tested at the proving grounds at Sandy Hook, N. J. (Army) and Indian Head, Md. (Navy). There are various ordnance repositories, arsenals, armories, etc. (See ARSENAL.) Heavy gun carriages have been made for the United States by the Bethlehem and Midvale Steel companies, which firms also supply all the steel forgings for cannon. Bethlehem has also made 8-inch, 10-inch, and 12-inch modern built-up cannon. Other American firms also have made heavy gun carriages, 12-inch mortars, and smaller guns, projectiles, etc. Explosives are furnished principally by the DuPont, the Laflin-Rand, and the California Powder companies. Revolvers, machine guns, etc., are furnished principally by Colt, and Smith & Wesson. In Europe the principal Government ordnance factories are at Woolwich Arsenal (England), Bourges and Puteaux (France), Turin and Naples (Italy), Alexandrovsk and Aboukhoff (Russia), Seville and Trubia (Spain). European nations depend principally for ordnance on private manufacturers, of which the most prominent are: Friedrich Krupp, at Essen, Germany; Sir W. G. Armstrong, Whitworth & Co., Ltd., Newcastle-on-Tyne, England, and Italy; Vickers Sons & Maxim Co., Ltd., England; Schneider et Cie, Le Creusot and Saint Chamond, France; Hotchkiss et Cie, Saint Denis, France; and the Skodawerke, Pilsen, Austria. Proving grounds are located at Havre and Hartleur, France; Spezia, Italy; and Essen, Germany.

ORDONNANCE DE LA MARINE, ôr'dō'nänS' de la mà'ren'. A naval code of admiralty law, in 5 books, issued by Louis XIV. of France, at Fontainebleau, in August, 1681. Book i. deals with the organization of admiralty jurisprudence; book ii. with the contractual relations between masters and seamen; book iii. with the entire subject of marine contracts, covering such topics as charter-party, affreightment, insurance, average, jettison, etc., also privateering and letters of marque and reprisal; book iv. with the administration of the customs; book v. with fisheries. Consult *Ordonnance de Louis XIV. . . . touchant la marine* (Paris, 1681).

ORDOVICIAN (from Lat. *Ordovices*, name of an ancient British tribe of North Wales), or LOWER SILURIAN SYSTEM. A division of geologic time following the Cambrian and preceding the Upper Silurian or Silurian proper. The Ordovician comprises rocks originally classed by Murchison as the lower portion of his Silurian system. It was considered to be of sufficient importance to be classed as a separate division by Lapworth in 1879, who proposed for it the term Ordovician. The type section of the American Ordovician is found in New York State, and consequently the names of many of the subdivisions are locality terms used in New York. It is as follows:

Ordovician	Trenton	Hudson Cincinnati Utica Trenton
	Canadian	Chazy Beekmantown, Calciferous

The Ordovician rocks are chiefly limestones, with the exception of the upper and lower members, which may be very shaly, indeed the Hudson River shales form a very prominent series of rocks in the Appalachian States. The Trenton rocks are widely distributed over the continent. The Ordovician strata are often found fringing the Archæan areas, being sometimes separated from them by but a thin strip of Cambrian. Thus there are belts of Ordovician rocks around the New York Adirondacks; from central New York westward to Wisconsin and Minnesota; along the line of the Appalachians on the eastern and sometimes on the western slope from Vermont to Alabama; around the V-shaped Archæan or Lauren-

tian of Canada; and in the Central States, in Ohio, Kentucky, Indiana, and Tennessee. Ordovician rocks are also known in the Uinta, Wasatch, and Rocky Mountains. In Europe the Ordovician rocks form a large area extending from Iceland into Russia. They are of considerable thickness in Great Britain and Wales. Additional areas are found in Bohemia, Germany, France, Portugal, Spain, and Northern Africa.

In neither North America nor Europe do we find any marked break between the Cambrian and Ordovician systems, but the faunal changes are well shown. There was during the Ordovician times a great interior sea over the United States, and the coastal States were also under water, but in the southwest much dry land was known. At the close of the Ordovician there were great disturbances. The mountains along the New York-New England border were formed and gave rise to the so-called Taconic ranges and the Green Mountains. Much faulting and folding accompanied the uplift. There was also developed a line of uplift in Ohio, Kentucky, and Tennessee, which domed the rocks up into a low, broad anticline known as the Cincinnati arch.

The life of the Ordovician, while being in advance of the Cambrian time, was not of a high order. Many seaweeds have been found, and cryptogams probably existed, though only scanty remains had been found. Being land plants, their preservation would be doubtful in marine sediments. Foraminifera and Radiolaria were abundant, as were also the sponges. In the Hudson River slates graptolites were very common. Among the corals were many representatives of the Tetracoralla, and also large cup corals like Streptelasma, while Columnaria was a common compound one. Cystidean crinoids are numerous, and many starfishes and even sea-urchins are known. The trilobites were very well developed, but the genera were largely different from those of Cambrian age. The brachiopods were represented by many well-known genera, especially Orthis, and many groups of Mollusca existed. Pleurotomaria among the gastropods, Orthoceras among the cephalopods were numerous. Fishes were the only representatives of the vertebrates, and of these were found armored ostracoderms in the Ordovician sandstones of Colorado. Fish teeth are known in the European Ordovician.

Among the useful minerals of the Ordovician are great quantities of building stone, including limestone and marble. In Ohio and Indiana great supplies of petroleum (q.v.) and natural gas occur in the rocks of the Cincinnati arch. Zinc and lead ores are mined in southeastern Missouri and the Upper Mississippi Valley in Wisconsin, Iowa, and Illinois. Along the contact between the Cambrian and Silurian in rocks in many parts of the Appalachians there are found deposits of limonite ores, many of which are mined.

BIBLIOGRAPHY. Dana, *Manual of Geology* (New York, 1895); Geikie, *Text-Book of Geology* (London, 1893); Ulrich and Schuchert, "Palæozoic Seas and Barriers in Eastern North America," in *Bulletin New York State Museum, No. 52* (Albany, 1902); Prosser and Cummings, "Sections and Thickness of Lower Silurian Formations in West Canada Creek and in the Mohawk Valley," in *Fifteenth Annual Report New York State Geologist*, vol. i. (Albany, 1897); Weller, "Palæozoic Formations," in *New Jersey Geological Survey Report for 1899* (Trenton, 1900); White, "The Original Trenton Rocks," in *American Journal of Science*, 4th series, vol. ii. (New Haven, 1896); Ruedeman, "Hudson River Beds Near Albany and Their Taxonomic Equivalents," in *Bulletin Geological Society of America*, vol. xii. (Rochester, 1900); Winchell and Ulrich, "The Lower Silurian Deposits of the Upper Mississippi," in *Minnesota Geology and Natural History Survey, Palæontology*, vol. iii. (Minneapolis, 1897). See GEOLOGY.

ORD'WAY, JOHN MORSE (1823—). An American chemist and educator. He was born at Amesbury, was apprenticed to an apothecary (1836-38), and graduated from Dartmouth College in 1844. He was a member of the faculty of Grand River College, Trenton, Mo., from 1850 to 1857, and thereafter held superintendencies in a chemical factory at Johnston, R. I., and in a print works in Manchester, N. H. After several years as consulting chemist, Ordway, in 1869, became professor of metallurgy and industrial chemistry in the Massachusetts Institute of Technology. In 1884 he was appointed professor of applied chemistry in Tulane University, New Orleans, where he reorganized the biological department, and in 1891 became head of the department of engineering. His original work includes valuable research on lubricating oils and on non-conducting coverings for steam-pipes.

ORE (AS. *ār, ar*, ore, brass, copper, bronze, Goth. *ais*, OHG. *ēr*, brass; connected with Lat. *æs*, copper ore, bronze, Skt. *ayas*, metal). A mineral mass containing one or more metals in sufficient quantity and purity to warrant its exploitation. In a mineralogical sense all metallic minerals are ores, but technically the term is limited to those rocks or minerals that can be mined and treated at a profit; thus, menaccanite (a mixture of iron and titanium oxides) is classed by mineralogists as an iron ore, although, owing to its composition, it is not utilized as such in metallurgy. An ore may contain metal in the native state, as most gold ores, or the metal may be chemically combined with other elements, as is illustrated by iron ores and most of the other commercial ores. See ORE DEPOSITS.

ÖREBRO, ē're-brō *or* ē're-brōō'. A seaport of Sweden, situated at the entrance of the Svartâ-Elf into the Hjelmar Lake, 135 miles west of Stockholm (Map: Sweden, F 7). Part of the town is built on an island in the river, and contains the old castle, now a museum. The church and the town hall are the most notable buildings. The town has manufactures of machinery, tobacco, matches, and chemicals. These industrial products, together with the minerals obtained from the neighboring silver, copper, and iron mines, are conveyed to Göteborg and Stockholm by means of the extensive system of canals which connects the lakes of the interior with the maritime ports. Population, in 1890, 14,547; in 1900, 22,013. At the Diet of Örebro, held in 1529, Lutheranism was established as the State religion of Sweden.

ORE DEPOSITS. The name applied to deposits or accumulations of metalliferous minerals or ores found in the earth's crust. The term ore includes those portions of the ore body in which the metallic minerals form a sufficiently large proportion to make their extraction profitable; aside from these there are often quantities of

associated non-metallic minerals forming masses containing little or no metal, which are termed the gangue. The metallic mineral of the ore is sometimes in the native or metallic form, but more commonly it is an oxide, sulphide, sulphate, carbonate, silicate, or some other salt of the metallic element. A deposit may contain the ores of one or several metals, and there may also be several compounds of the same metal in any one deposit. Gold, platinum, and tin are usually found in the native condition, while copper, lead, and zinc commonly exist as sulphides and iron as oxides. The common gangue minerals are quartz, calcite, barite, dolomite, fluorite, hornblende, feldspar, etc. They may sometimes be so evenly mixed with the metallic minerals that it is necessary to crush the ore and separate the two by mechanical or magnetic methods, while at other times the gangue forms horses (q.v.) which can be easily separated or avoided in mining. Ore deposits vary greatly in form, size, and geological position as well as in their mode of origin.

ORIGIN. The fact that the deposits occur as masses of greater or less concentration may be explained in two ways: that they have been formed contemporaneously with the inclosing rock, or that they have been formed by a process of concentration at a later date. The former theory involves a consideration of ore occurrences in both igneous and sedimentary rocks. If the ore in an igneous rock were formed at the same time as the rock, it would indicate a crystallization of metallic minerals from the igneous magma during cooling, and this in some cases is true. If the ores of sedimentary rocks were of contemporaneous origin, then the deposit must be a bedded one, conforming to the strata of the rock; this supposition requires the presence of metalliferous minerals in and their deposition from sea water. While certain metallic elements are found in the waters of the ocean, their quantity is extremely small and not to be compared with the amount which may be found in disseminated or concentrated form in sedimentary and igneous rocks. Some economic geologists have assigned a contemporaneous origin to certain ores found in sedimentary strata, but the majority at the present day believe that most ore deposits have been formed by the process of concentration. That metallic minerals are widely distributed, although in small quantities, in both igneous and sedimentary rocks, has been shown by the researches of Sandberger and others, and the quantity of them found in igneous rocks is slightly greater than that occurring in sediments. Since, however, the sediments were originally derived from the igneous rocks, it follows that the latter must be the original source of the minerals. Where ores have resulted by a natural process of concentration, their accumulation requires the presence of disseminated metals in the earth's crust, the existence of a solvent and carrier, and the presence in most cases of cavities in which precipitation of the ore occurs. The first point has already been referred to. As regards the second, it is found that the analyses of many spring and mine waters have shown the presence of metallic elements in solution, including gold, silver, copper, zinc, lead, and mercury. Indeed, some of these metals are actually being deposited in some hot springs at the present day: Weed has described a spring in Montana which carries gold and has deposited its burden of auriferous quartz on the plants near its mouth. That there is a wide circulation of meteoric water in the rocks of the earth's crust has been quite clearly shown by the work of Van Hise. The return of this water to the surface may occur along fissures or other openings which it can easily follow. That these circulating meteoric waters may play an important rôle in the concentration of many

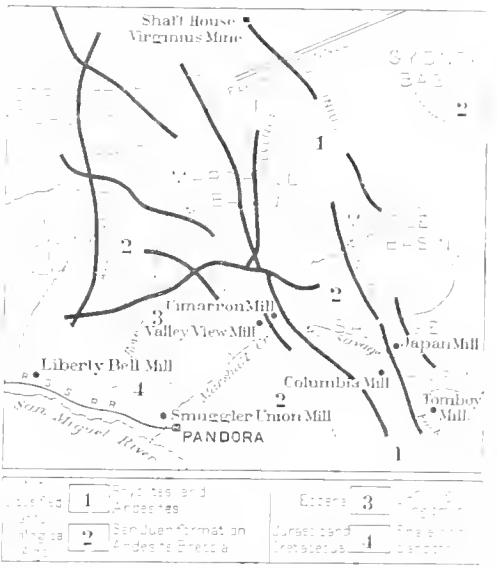


FIG. 1. GEOLOGICAL SKETCH MAP OF THE TELLURIDE DISTRICT, COLORADO.

ores is no doubt true, and some geologists even consider that most ores have been formed in this manner. On the other hand, it has been pointed out that most ore deposits are closely associated with igneous rocks, and in some cases with hot springs, and that therefore the former have served to open the way for heated waters and vapors whose solvent power is much greater than that of cold water. The advocates of the meteoric circulation theory believe that the waters have penetrated to the lower depths of the crust or bary-sphere, where metallic particles are considered to be abundant, and brought them toward the surface, where they were deposited. Those who consider the presence of igneous rocks to be an important factor in ore deposition also believe that the minerals may in some cases have been brought from a great depth in solution in the waters given off by the igneous magma, but that in some instances the igneous intrusion itself may have been the source of the minerals.

While all minerals are slightly soluble in cold water, this solvent power may be greatly increased by heat, pressure, and the presence of alkaline salts or other compounds. The metals may thus be leached out of the rock at some depth and out of contact with the air. When the solutions approach the surface or enter a cavity, the load of dissolved minerals is deposited either wholly or in part, as a consequence of cooling of the ore-bearing solution, decrease in pressure, and in some cases of the oxidizing effect of the atmosphere which converts certain soluble salts into an insoluble form. Iron compounds, for example, may go into solution in the form of carbonate, but on exposure to the air the latter

is rapidly changed to limonite, the hydrous oxide, which is insoluble. Since many ore deposits are formed in cavities, the question arises to what depth in the earth's crust cavities may extend. Investigations of Van Hise have pointed out that there can be recognized in the earth's crust two physico-chemical zones. In the upper one, which is close to the surface, the temperature and pressure in the rock are not great. In the lower zone, which is at some depth below the surface, both temperature and pressure are great, and consequently chemical reactions take place. This lower zone Van Hise divides into three parts, namely: an upper zone of fracture, in which the rocks are broken up by movements along the surface of the zones, but no movement in the zone itself; an intermediate zone of fracture and flowage; and a lower zone of flowage, in which a mashing or kneading action takes place, which involves every particle of rock. Within the last mentioned zone it would not be possible, therefore, for any cavities to exist, and Van Hise has figured out that approximately the maximum depths at which cavities can exist varies from 1625 feet in shales to 32,500 feet in firm granites.

The cavities in which the ores are precipitated have been formed in several different ways. The small ones, when existing in sedimentary rocks, are probably due to the presence of pores between the grains, or in the case of igneous rocks are gas cavities. More extensive ones may be caused by solution, especially in limestones, where caves are often formed by the solvent action of water, by contraction upon cooling or drying, which divides the rock along joint planes, or by folding or faulting of the strata, which may open fissures of considerable depth and length. The presence of cavities is not, however, necessary for the deposition of ore, since the conditions which are sometimes favorable to its precipitation may also favor the solution of other minerals, and thus the particles of a common rock may be slowly dissolved while ore is precipitated in its place. This process, which is known as replacement or metasomatism, is not uncommon, and often involves a large mass of rock, some deposits being formed wholly in this manner. The boundary of a deposit formed chiefly in a cavity may sometimes be indefinite because replacement of the walls by ore has taken place.

Form. Ore deposits vary greatly in their form, and this character has sometimes been used as the basis of classification. Certain forms are so numerous as to deserve special mention.

Veins are filled fissures sometimes extending vertically, but more often inclined toward the horizontal. They have commonly been filled by deposition from solution, and in this respect differ from dikes (q.v.). In the true fissure-vein the ore deposit, which is tubular in form, shows a banded structure due to the deposition of successive layers on the walls of the cavity. These layers or bands may represent different ores or consist of alternating layers of ore and gangue. At times, especially when the fissure is very narrow, the ore-bearing solutions may not only have filled the fissure, but have penetrated the wall rock as well, either filling the pores, or more often replacing portions of it, and then there will be a gradation from vein matter to the wall rock. Where the fissure is extremely narrow the ore owes its presence almost entirely to replacement; such veins lack a banded structure, being thereby distinguished from those formed by filling alone. If the vein is inclined the lower wall is spoken of as the foot-wall, and the upper one as the hanging wall. Veins often split, narrow (pinch), or widen (swell), and change their direction. In passing through hard, massive rocks like quartzite, the vein fissure is apt to be clean-cut, but where the fissure passes through soft rock like shale or some dikes it may split up into a number

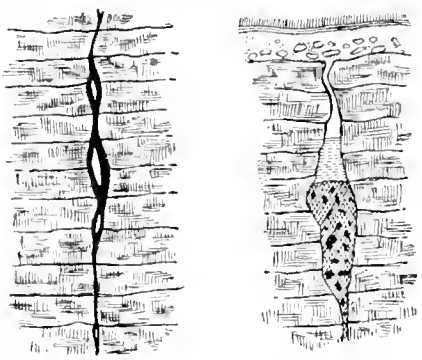


Fig. 2. Sections of Gash Veins, Fresh and Disintegrated. The heavy black shading indicates galena

of small stringers. A parallel series of closely spaced veins is termed a *lode*. Veins may often intersect, and of two which cross each other one may be of a later date and follow a fault plane which has broken and displaced the earlier one. The ore in such cases is apt to be much richer at the point of intersection. Even in a single vein the ore may follow certain streaks which are termed *shutes*, or again it may be restricted to pockets of great richness, which are known as *bonanzas*. Of the different gangue minerals found in veins, quartz is the commonest;

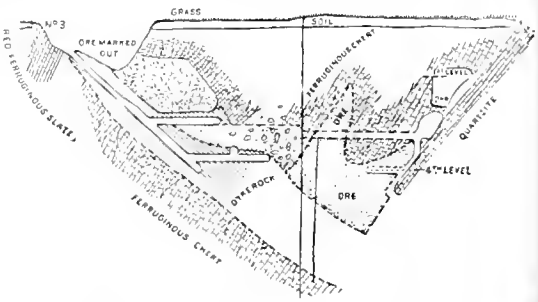


Fig. 3. Cross-section of Colby Mine, Penokee-Gogebic District, Michigan.

in some regions, as California, quartz veins are extremely abundant and often carry considerable gold. Since the quartz is commonly resistant to the weather, the wall rocks may often decompose and wash away, leaving the outcrop of the vein extending as a ledge or ridge along the surface. Veins vary in width from a few inches to several hundred feet and their outcrop or apex (q.v.) is sometimes traceable for a long distance. *Gash veins* are a special type of local extent, formed by the enlargement of joint fissures.

The manner in which fissure veins have been filled, and the source of the metals which they

contain, has been a subject of prolonged discussion among economic geologists. Some have argued for the theory of lateral secretion, considering that the waters which carried the

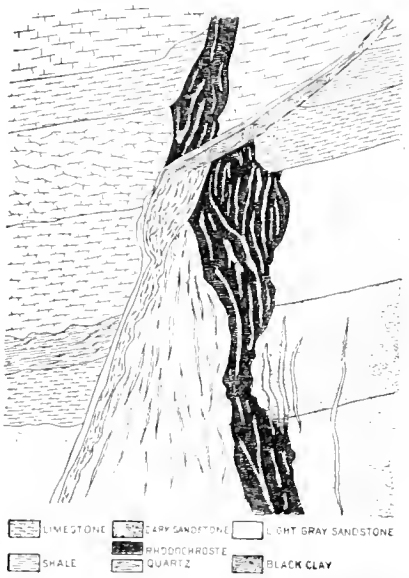


FIG. 4. THE JUMBO VEIN FAULTED BY A CROSS-VEIN.

metals had dissolved them from the immediate walls of the fissure on either side of the vein. Others combat this view and claim that the solutions had brought the metals from below and followed the fissure upward. This is known as the theory of ascension. The views held by most geologists at the present day are an amplification of the theory of lateral secretion, the idea having been first brought forward in studying the deposits of Leadville, Colo.

The term *impregnation* is applied to those deposits which have been formed by the deposition of ore in minute cavities of porous rock or in the crevices of a breccia. *Ore channels* are deposits formed along some path of easy access to the mineral solutions, as along the boundary between two kinds of rock. *Bedded deposits* are formed parallel to the stratification of sedimentary rocks. *Contact deposits*, as now defined, represent ore bodies formed along the contact of a mass of igneous and sedimentary rock, the ore having been derived wholly or in part from the intrusive masses. *Chamber deposits* include those formed in caves of solution. *Placer deposits* include a series of gravel deposits of sedimentary origin. These are widely distributed, especially in the Western States, and are a common source of gold, platinum, and sometimes tin.

WEATHERING. Most ore deposits have been changed superficially by weathering, the depth of this alteration varying from a few feet to several hundred: in the Rocky Mountains, 300 to 400 feet is not uncommon, and 1000 feet is extreme; in Chile a depth of 1500 has been recorded. Where the ore body contains iron-bearing minerals the oxidation of these may stain it heavily with limonite, and to this the name of *gossan* is often applied. At some localities the leaching out of the other minerals has naturally resulted in the concentration of the iron contents, so that the gossan can be worked as an ore of the latter mineral, while below the zone of weathering the deposit supplies a different type of ore, namely, that which originally predominated in it. The changes caused by weathering are both physical and chemical, or the same as would occur in

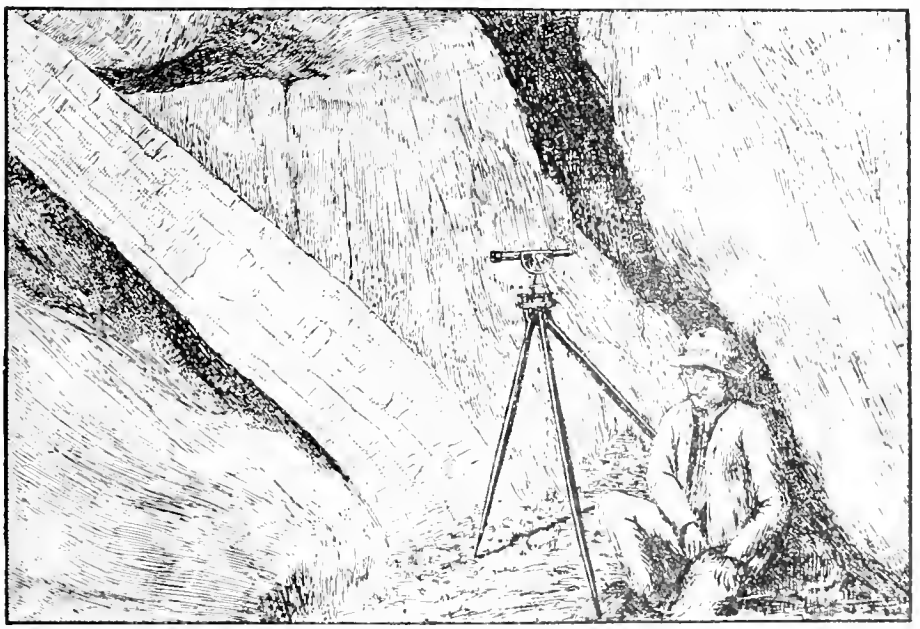


FIG. 5. GOLD QUARTZ VEIN IN MARYLAND MINE, GRASS VALLEY, CALIFORNIA, SITUATED ON 1450-FOOT LEVEL, 2½ FEET THICK AND VERY RICH.

rocks, the difference being that the metallic minerals are more easily affected. The physical changes involve a disintegration of the mass. The chemical effects include processes of oxidation, hydration, and solution. Sulphides are changed to sulphates and chlorides, oxides to carbonates and silicates. One result of this change is to convert many insoluble compounds into soluble ones; and these latter are taken up by percolating waters, carried to a lower depth and there deposited, in some cases producing a *zone of local enrichment* at the water-line, that is, at the boundary of the gossan, or oxidized part, and the unaltered portion of the ore body.

VALUE. The quantity of metal necessary to make mining operations profitable depends largely on the character of the ore. Lake Superior copper ores contain as little as 0.65 per cent. of native copper; and many copper sulphide ores running as low as 2 or 3 per cent. metallic copper are successfully worked. Many low-grade lead and zinc ores are profitably worked because their gold and silver contents more than pay the cost of metallurgical treatment. Gold ores alone, running as low as $2 to $3 per ton, can be successfully worked under favorable conditions. In nearly every case the metallic contents of the ore is increased by mechanical concentration or by roasting (in the case of sulphides), or both, before the ore is smelted.

CLASSIFICATION. Numerous attempts have been made to develop a suitable classification of ore deposits, and the schemes suggested have been based either on the form, mineral contents, or mode of origin of the ore body. The first is perhaps the most practical from the miners' standpoint. The second is undesirable because several kinds of ore may often be found in the same ore body. The third is probably the most scientific, and is of value to the mining geologist and mining engineer, as it serves as a guide toward judging the possible extent or irregularity of the ore masses under consideration. The classification proposed by W. H. Weed, which is given below, includes the most recent discoveries and ideas on the origin of ore deposits. This classification is based entirely on the origin of the ore mass.

GENETIC CLASSIFICATION OF ORE DEPOSITS.

I. Igneous (magmatic segregations).
  A. Siliceous: Aplitic masses, quartz veins of Alaska, etc.
  B. Basic: Peripheral masses and dikes.

II. Pneumatolytic Deposits (deposited by igneous emanations; the gases being above the critical point).
  A. Contact metamorphic deposits (characterized by gangue of garnet, epidote, actinolite, calcite, and other lime-alumina silicates).
  B. Veins. (Closely allied to magmatic veins and to Division IV.)

III. Fumarole Deposits (metallic oxides, etc., in clefts in lavas, of no commercial importance).

IV. Gas-Aqueous Deposits (igneous emanations mingled with ground waters).
  A. Filling Deposits: Fissure veins, impregnations of porous rock, and cementation deposits.
  B. Replacement Deposits: Veins, stocks, chimneys, etc., formed by replacement of wall rock.

V. Deposits from meteoric waters.
  A. Underground: Veins and replacements.
  B. Surficial: Bog ores, gold placers, etc.

Igneous ore deposits constituting the first division are those in which the metallic minerals have crystallized directly from the igneous magma during cooling. Such deposits may occur in dikes, or on the periphery of igneous masses; the collecting or gathering of the ore particles being the result sometimes of mutual attraction or again of convection currents set up during cooling. In pneumatolitic deposits it is considered that the conditions bear out the statement that the igneous mass during its intrusion and cooling may give off metallic minerals, siliceous compounds, and gases. Thus at San José, Tamaulipas, Mexico, a great laccolitic mass of andesitic rock has penetrated a Cretaceous limestone, the latter being a nearly pure carbonate of lime, and yet in the contact zones are found garnet, magnetite, pyrite, and chalcopyrite, all (except the garnet) containing matter foreign to the limestone. All of these must therefore have been emissions from the igneous magma. The gas-aqueous deposits include those which have been deposited from a mixture of water and steam, probably under pressure and at a high temperature. They may either fill true fissures or porous deposits, or replace the wall rock lining a narrow fissure. The last class recognized is the result of meteoric circulation, the waters carrying the ore particles to points of concentration; this may occur either underground or on the surface.

DISTRIBUTION. Ore deposits are not confined to any particular geological horizon, although the mechanically formed and some of the surficial ones are commonly of Pleistocene and less often Tertiary age. In the United States ore deposits are widely distributed, but, owing to their frequent association with igneous rocks, they predominate in the Cordilleran region, Black Hills, and the Appalachians, where igneous activity has been most pronounced. In other areas their accumulation seems to be chiefly the result of meteoric waters. Gold and silver ores are chiefly restricted to fissure veins, and hence predominate in the Cordilleran region, although additional vein deposits of gold are known in the Black Hills, Southern Appalachians, and Alaska.

Copper ores are known in large deposits in Keeweenaw Point, Mich., Bisbee, Ariz., and Butte, Mont. The Paleozoic limestones of Missouri, and the region covering the contact point of Iowa, Illinois, and Wisconsin, contain both lead and zinc, and large zinc deposits are mined in the Cambrian limestones of northwestern New Jersey. The hematite iron ores of the Lake Superior region are the largest deposits in the world, but others are known in the Silurian of the Appalachian region, and the metamorphic rocks of the Highland region. For further details regarding the distribution of ore deposits, see GOLD, SILVER, COPPER, etc., also the paragraphs on mining, under the different countries.

BIBLIOGRAPHY. General works: Kemp, *Ore Deposits of the United States and Canada* (New York, 1900); Whitney, *Metallic Wealth of the United States* (Philadelphia, 1854); Phillips, *Treatise on Ore Deposits* (London, 1884); Tarr, *Economic Geology of the United States* (New

York, 1895); Fuchs and De Launay, *Traité des gites minéraux et métallifères* (Paris, 1893); Beck, *Lehrbuch der Lagerstattenkunde* (Berlin, 1900); Von Cotta, *Ore deposits*, trans. by Prime (New York, 1870). Works dealing chiefly with genesis of ore deposits: Crosby, "A Classification of Economic Geological Deposits Based on Origin and Original Structure," in the *American Geologist* (Minneapolis, 1899); Emmons, "The Structural Relations of Ore Deposits," in the *Transactions of the American Institute of Mining Engineers*, vol. xvi. (New York, 1886); Emmons, "The Genesis of Certain Ore Deposits," ibid., vol. xv. (ib., 1885); Groddeck, *Die Lehre von den Lagerstätten der Erze* (Leipzig, 1879); Kemp, "An Outline of the Views Held To-Day on the Origin of Ores," in *The Mineral Industry*, vol. iv. (New York, 1895); Posepny, "The Genesis of Ore Deposits," in the *Transactions of the American Institute of Mining Engineers* (ib., 1893); Vogt, "The Formation of Eruptive Ore Deposits," in *The Mineral Industry*, vol. iv. (ib., 1895); Vogt, "Ueber die relative Verbreitung der Elemente, besonders der Schwermetalle, und über die Concentration des fein vertheilten Metallgehaltes zur Erzlagerstätten," in the *Zeitschrift für praktische Geologie* (Berlin, 1898-99); Penrose, "The Superficial Alteration of Ore Deposits," in *Journal of Geology*, vol. ii. (Chicago, 1894), an excellent general article; Weed, "Contact Metamorphic and Other Ore Deposits Near Igneous Contacts," and "Vein Enrichment by Ascending Alkaline Waters," in *Engineering and Mining Journal*, vol. lxxiv. (New York, 1902). Also many articles in the *Transactions of the American Institute of Mining Engineers* (New York, 1900-02).

ORE DRESSING. The preparation of ore for the smelter by mechanical means, whereby the valuable minerals are concentrated into smaller bulk and weight by the separation of the waste, or whereby two valuable minerals are separated from each other. The object of ore dressing is to save handling so much barren or waste material in the subsequent metallurgical process of extraction. Ore dressing may be divided into two processes—crushing and separation. Crushing detaches the valuable minerals from the waste, but as they are still mixed in the resulting powder there has to be a further process of separation.

CRUSHING. Preliminary breaking of the ore is done by blasting in the mine, but crushing proper is performed on the surface. The crushing process may stop short at the production of coarse fragments, or it may be continued to the production of a fine powder by grinding. The various machines used for crushing and grinding ores are described in the article on GRINDING AND CRUSHING MACHINERY. The selection of the particular machines used depends upon the character of the ore and the method of extraction adopted. *Rolls* are the standard machines for crushing all brittle ores in preparation for concentration except where fine crushing is required. *Steam stamps* are the standard crushers for ores containing native copper. *Gravity stamps* are used most extensively for fine crushing, but various forms of *ball mills* are beginning to compete with them for this work. Generally the preliminary crushing is done by jaw or gyratory crushers, and from them the material passes to rolls or stamps. It is an advantage in most cases to crush first to a coarse size, then to separate as much of the waste as possible, and then to recrush the residue and again separate the waste. The sizes to be crushed and the number of repetitions vary for different ores.

SEPARATION. Having the ore crushed, the succeeding process is to separate the valuable ore from the waste. Some of the principal apparatus and methods for performing this operation are as follows: *Preliminary washers* are used to disintegrate and float adhering clay or fine stuff from the coarse particles, which is done by using running water aided by some stirring device. *Sizers* and *screens* are used for separating the coarse from the fine particles of the ore; they may be classified as: (1) stationary screens, (a) grizzlies or bar screens, (b) gravel screens of wire cloth, (c) perforated plate screens, and (2) moving screens, (a) oscillating bar screens, (b) plain shaking screens or riddles, and (c) revolving screens or trommels. *Classifiers* are devices for obtaining a series of products of diminishing size by means of currents of water. The most common form consists of a channel connecting a series of pockets. Water is supplied to each pocket so as to form an upward current, the force of the current in each pocket after the first being less than that in the preceding pocket. The effect produced is that grains which are heavy enough to settle against the upward current in each pocket can do so, while the lighter grains are carried on to succeeding pockets until they strike one where the current is mild enough to permit them to settle.

Hand picking is the process of separating the waste from the valuable ore by picking it out by hand. This work is usually done on 'tables.' There are five classes of picking tables in use: (1) stationary horizontal tables; (2) stationary sloping chutes; (3) shaking tables; (4) belt, rope, or plate conveyors; and (5) revolving circular tables. *Hydraulic jigs* operate through the action of two currents of water, an upward and downward, alternating with each other in quick succession, upon a bed of sand supported by a screen. The screen may be pushed up and down in a tank of water to bring about the necessary current action; or it may be stationary while a reciprocating motion is given to the water. In either case the effect is to separate the crushed material in layers according to the specific gravity of the particles.

Vanners consist essentially of an endless belt which is shaken rapidly either sidewise or endwise and which has a continuous slow motion uphill. The ore is fed onto the belt in the form of wet pulp. The agitation makes the ore bed so loose that particles of higher specific gravity rise to the upper layer. The travel of the belt draws the heavy minerals to the head end, while the water washes the light minerals down to the tail. *Buddling tables* operate much as do vanners, the bumping action separating the particles according to specific gravity and shaking the heavier particles to one side of the table while the water current carries the lighter particles to the other side. *Pulsating sizing tables* depend upon the relative transporting power of a film of water flowing on a quiet surface to set upon the particles of ore. As is well known, a film of water flowing over a quiet surface has an upper current which moves faster than the lower current, whose water is re-

tarded by friction; the heavier grains remain at rest in the slow bottom current, while the lighter grains are carried away by the quick top current. *Magnetic separators* utilize the action of an air current to separate particles of low specific gravity from those of higher specific gravity. For a comprehensive discussion of the methods and machinery used in crushing and separating ores, see Richard, *Ore Dressing* (New York, 1900); and for an annual record of current progress in this art, see the annual volumes of the *Mineral Industry* (New York).

OR'EGON (named from the *Oregon*, now the Columbia, River, probably an American Indian name). A western State of the United States, lying on the Pacific Slope, between latitudes 42° and 46° 18′ N., and between longitudes 116° 33′ and 124° 25′ W. It is bounded on the north by the State of Washington, on the east by Idaho, on the south by Nevada and California, and on the west by the Pacific Ocean. Its extreme length from east to west is 396 miles, and from north to south 300 miles. Its area is 96,030 square miles, of which 94,560 square miles, or 60,518,400 acres, are land surface. It ranks seventh in size among the States.

Topography. The salient features of the topography are the two mountain ranges extending parallel with the coast through the western part of the State, and the great inland plateau in the east. The coast is rocky and abrupt, and runs in an almost straight line north and south, with no very prominent inlets or headlands. There are, however, besides the wide mouth of the Columbia River on the north boundary, several small bays or harbors, such as Tillamook, Winchester, and Coos bays, all of which are landlocked, with narrow entrances. Near the southern boundary the coast runs out in an obtuse angle ending in Cape Blanco. The land rises immediately from the coast to the crest of the Coast Range, which is about 20 miles inland, and has a height of 1000 to 4000 feet. It is heavily forested, and though of irregular outline, with many transverse valleys, it is unbroken, save in two or three places, throughout the length of the State. The Cascade Mountains run parallel with the Coast Range about 120 miles from the coast. They are the prolongation of the Sierra Nevada, rise to an average height of over 6000 feet, and are crowned by a line of extinct volcanic cones, several of which are over 9000 feet high, while Mount Hood, the culminating point near the northern boundary, has an altitude of 11,225 feet. Like the Coast Range, the Cascades are heavily forested, and their summits are covered with snow. Between the two ranges extends a broad valley, divided by several spurs and cross ranges, and becoming rough and mountainous in the south, while the northern half forms the rolling prairie valley of the Willamette. The region lying east of the Cascades covers two-thirds of the area of the State, and consists of an elevated plateau. The southern half of this belongs to the Great American Basin, though its floor has an elevation of 5000 feet, rising to 6000 feet in the southeast. Several of the longitudinal Basin Ranges of Nevada extend into this plateau, and large areas are covered with lava flows. The northern half slopes northward toward the valley of the Columbia River. It is more undulating than the southern plateau, and is traversed in the northeast by the Blue Mountains, an irregular chain rising to a height of 7000 feet, and sending out side spurs flanked by deep valleys. Some of the rivers in this region have cut deep cañons, especially the Snake River on the northeastern boundary, whose cañon almost rivals that of the Colorado.

Hydrography. The Columbia River forms, with an interruption at the Falls of the Dalles, a large, navigable waterway for 300 miles along the northern boundary. Its chief tributaries in the State are the Willamette west of the Cascades, and on the eastern plateau the Deschutes, John Day, and Umatilla, whose branches form a considerable network of minor streams. The Snake River, which joins the Columbia in Washington, forms about one-half of the eastern boundary, and its chief tributary, the Owyhee, runs inside the boundary along the remaining half. The streams flowing directly into the ocean are mostly short, but two of them, the Umpqua and the Rogue, rise on the Cascades and break through the Coast Range. On the interior plateau there are a number of streams running into lakes which have no outlet. There are a number of lakes of considerable size in the south-central portion, the largest of which are Goose Lake, which lies partly in California; Klamath Lake, at the base of the Cascades, 30 miles long; and Malheur Lake, on the eastern plateau, 22 miles long.

Climate. In few places is the influence of topography on climate more apparent than in Oregon. The winds from the ocean are deprived of nearly all their moisture by the Coast and Cascade ranges, which also bar out the tempering influence of the sea, so that the portion west of the Cascades has a moist and equable insular climate, while east of the mountains the climate is dry and continental, with great extremes. On the coast winds from the sea temper the summer heat, and tend to reduce the cold of winter, while cold winds from the northeast are barred out by the mountains. Here the mean temperature for January is 42.2°, and for July 62.3°, while great extremes are rare. On the eastern plateau the mean temperature is 29.6° for January and 66.9° for July, while the extremes fall below zero every winter, sometimes nearly 30° below, and rise above 100° every summer, the maximum record being 119°. In regard to rainfall there is a still greater difference between the two regions. In the west the rainfall is abundant, and in some places excessive. West of the Coast Range it averages 89.6 inches, in the Willamette Valley it is 50.8 inches, while in Tillamook County it is nearly 140 inches. On the eastern plateau it is insufficient for the needs of agriculture, being on the average 12.7 inches, and in the south-central portion only 6.5 inches. More than three-fourths of the rainfall of the State occurs in the wet season from October to March. Thunderstorms are rare in Oregon, and never severe, while hurricanes are unknown.

Soil and Vegetation. The soil on the highlands and plateau consists of decomposed lava, and in the valleys it is a rich black alluvial deposit. With the exception of some extensive tracts of sand and of volcanic ashes and pumice in the east, the soil is everywhere of great fertility, and even in the east capable of yielding heavy crops when irrigated. The eastern plateau, however, consists largely of arid plains covered

AREA AND POPULATION OF OREGON BY COUNTIES.

County.	Map Index.	County Seat.	Area in square miles	Population.	
				1890	1900.
Baker	H 5	Baker City	2,275	6,764	15,597
Benton	B 5	Corvallis	677	8,650	6,706
Clackamas	C 4	Oregon City	1,861	15,233	19,658
Clatsop	B 4	Astoria	820	10,016	12,765
Columbia	B 4	St. Helen	677	5 191	6,237
Coos	A 6	Coquille	1,578	8,854	10,324
Crook	D 5	Prineville	7,756	3,244	3,964
Curry	A 7	Goldbeach	1,454	1,769	1,808
Douglas	B 6	Roseburg	4,861	11,864	14,565
Gilliam	E 4	Condon	1,133	3,600	3,201
Grant	F 5	Canyon City	4,560	5,080	5,048
Harney	F 6	Burns	9,086	2,559	2,598
Jackson	C 7	Jacksonville	2,721	11,455	13,698
Josephine	B 7	Grants Pass	1,684	4,878	7,547
Klamath	D 6	Klamath Falls	5,854	2,444	3,970
Lake	F 7	Lakeview	7,824	2,904	2,847
Lane	B 6	Eugene	4,380	15,198	19,604
Lincoln	B 5	Toledo	1,008		3,575
Linn	C 5	Albany	2,311	16,295	18,903
Malheur	H 6	Vale	9,584	2,601	4,303
Marion	C 5	Salem	1,170	22,934	27,713
Morrow	F 4	Heppner	2,021	4,205	4,151
Multnomah	C 4	Portland	429	74,884	103,167
Polk	B 4	Dallas	701	7,858	9,923
Sherman	F 4	Moro	736	1,792	3,47
Tillamook	B 4	Tillamook	1,119	2,932	4 471
Umatilla	G 4	Pendleton	3,116	13,281	18,049
Union	G 4	Union	3,116	12,044	16,070
Wallowa	H 4	Enterprise	2,784	3,661	5 538
Wasco	D 4	The Dalles	2,962	9,183	13,199
Washington	B 4	Hillsboro	715	11,972	14,467
Wheeler	E 5	Fossil	1,546		2,442
Yamhill	B 4	McMinnville	711	10,692	13,420


OREGON AND WASHINGTON
SCALE OF MILES
0 10 20 30 40 50 60 70 80 90 100 110 120
County Towns
Railroads
Longitude West from Greenwich
COPYRIGHT, 1901 AND 1903, BY DODD, MEAD & COMPANY.

AREA AND POPULATION OF WASHINGTON BY COUNTIES.

County.	Map Index.	County Seat.	Area in square miles.	Population.	
				1890	1900.
Adams	G 3	Ritzville	1,696	2,098	4,840
Asotin	H 3	Asotin	631	1,580	3,366
Chehalis	A 2	Montesano	1,908	9,249	15,124
Chelan	E 2	Wenatchee	3,070	....	3,931
Clallam	A 1	Port Angeles	1,807	2,771	5,603
Clarke	C 4	Vancouver	646	11,709	13,419
Columbia	H 3	Dayton	876	6,709	7,128
Cowlitz	B 3	Kalama	1,115	5,917	7,877
Douglas	F 3	Waterville	4,708	3,161	4,926
Ferry	G 1	Republic	2,313	....	4,562
Franklin	G 3	Pasco	1,251	696	486
Garfield	H 3	Pomeroy	725	3,897	3,958
Island	C 1	Coupeville	208	1,787	1,870
Jefferson	A 2	Port Townsend	1,765	8,368	5,712
King	D 2	Seattle	2,051	63,989	110,053
Kitsap	C 2	Port Orchard	407	4,624	6,767
Kittitas	E 2	Ellensburg	2,414	8,777	9,704
Klickitat	E 4	Goldendale	2,079	5 167	6,107
Lewis	B 3	Chehalis	2,336	11,499	15,157
Lincoln	G 2	Davenport	2,299	9,312	11,969
Mason	B 2	Shelton	903	2,826	3,810
Okanogan	E 1	Conconully	5,318	1,467	4,689
Pacific	B 3	Southbend	925	4,358	5,983
Pierce	C 2	Tacoma	1,554	50,940	55,515
San Juan	B 1	Friday Harbour	187	2,072	2,928
Skagit	C 1	Mount Vernon	1,874	8,747	14,272
Skamania	C 1	Stevenson	1,713	774	1,688
Snohomish	C 1	Everett	1,651	8,514	23,950
Spokane	H 2	Spokane	1,777	37,487	57,542
Stevens	G 1	Colville	3,945	4,341	10,543
Thurston	B 3	Olympia	763	9,675	9,927
Wahkiakum	B 2	Cathlamet	273	2,526	2,819
Wallawalla	G	Wallawalla	1,277	12,224	18,680
Whatcom	D 1	New Whatcom	2,226	18,591	24,116
Whitman	H 2	Colfax	2,105	19,109	25,360
Yakima	D 3	North Yakima	5,784	1,429	13,462

with sage-brush, or with extensive salt marshes. The northern table-lands are covered with bunch-grasses suitable for grazing, and here are some junipers and pines. Western Oregon still contains one of the heaviest timber belts in the world. The entire western slope of the Cascades is covered with a belt of forest 20 miles wide, and the Coast Range is also densely forested. In the valleys are found cottonwoods, maple, ash, alder, dogwood, and wild cherry. There are seven species of oak, and the fragrant Oregon myrtle (*Oreodaphne Californica*) is a common tree. The coniferæ, however, predominate in the large forests, and include pines, spruces, firs, hemlocks, cedars, junipers, larch, and yew. Some characteristic species are the Oregon yellow pine (*Pinus ponderosa*), the Western arbor-vitæ (*Thuya gigantea*), the *Picea nobilis*, and the Oregon yew (*Taxus brevifolia*). For *Fauna*, see this section under UNITED STATES.

GEOLOGY. The most remarkable feature of the geological history of Oregon is the enormous volcanic eruption which took place principally in Miocene time, one of the most extensive lava flows in the world. The Cascade Mountains are entirely composed of lava and basaltic rocks, and a lava-sheet 1000 feet thick or more covers the whole eastern two-thirds of the State, together with large parts of Washington and Idaho. Some parts are much weathered and dissected, while others are more recent and smooth. The underlying rock formations are generally shown only where the rivers have cut through the lava. In the Snake River cañon in the northeast the rocks are ancient metamorphic granites, gneisses and mica-slate, while the Cascades are underlaid throughout with Cretaceous rocks covered for some distance (beneath the lava) with Eocene and Miocene strata. In the southwestern valley there is a belt of slates and serpentine, but the Coast Range is mainly an anticlinal whose surface consists of Tertiary sandstone.

MINERALOGY AND MINING. Oregon has a great wealth and variety of mineral resources, and, curiously enough, some of the richest mineral deposits are found in the valleys. Thus in the serpentine belt in the southwest there are lodes of chrome iron, copper, magnetite, and nickel. The nickel ore exists as a green hydrated nickel-magnesia silicate filling large irregular cavities in the serpentine. The deposit of this is supposed to be very extensive. Limonite, or brown hematite iron ore, is found in the Willamette region, and quartz veins bearing gold and silver occur in the slate belts east of the serpentine as well as in the Cascades and in eastern Oregon, where there are also deposits of zinc and cinnabar. Beds of lignite exist in the Cretaceous and perhaps in the Tertiary strata of the Coast Range, and the sandstones of the latter, as well as the limestones in the south and the volcanic rocks, furnish inexhaustible supplies of building stone. Other minerals found are mercury, platinum, iridium, lead, and antimony, as well as clay, salt, and alkali deposits. Gold is the only mineral extensively mined. It is produced chiefly in the Blue Mountain region in the northeastern part of the State. The annual output has latterly exceeded $1,000,000 in value, reaching $1,694,700 in 1900. Small quantities of silver, borax, and coal are mined, the coal being of the lignite variety.

FISHERIES. Salmon fishing and canning is one of the most important industries, and is unequaled by any other State. It began in 1866, and the value of the annual product since 1870 has fluctuated around $2,000,000, the maximum being reached in 1883. Over 5000 people, including many Chinese, have been employed most of this period. For a time reckless overfishing threatened exhaustion of the supply, but the enforcement of laws and the establishment of hatcheries have averted this danger. Sturgeon, halibut, oysters, and other varieties of fish are caught in less quantities. The erection of refrigerating and freezing plants and the increased use of refrigerator cars have made possible greater shipments of fresh fish and have thus tended to lessen the amount of the canned product.

AGRICULTURE. The different sections of the State, varying so distinctly in climate, topography, and soil, naturally vary in agricultural development. In the river valleys west of the Cascades almost every variety of crop common to the temperate zone is produced in great abundance. The Willamette Valley especially is noted for its great productivity. East of the Cascades, in the Columbia Valley, the rainfall is generally sufficient to justify the raising of some of the more hardy crops, the favorable years producing enough to cover the loss in the years of drought. Irrigation is possible in parts of this region and is being resorted to with success. Save in the centre of Oregon there are numerous rivers throughout the eastern half of the State which afford an extensive water supply that could be utilized for irrigation. But these sources have as yet been very little developed, owing largely to the remoteness from lines of transportation and markets. The irrigated area in the State increased from 177,944 acres in 1889 to 388,310 acres in 1899. Almost the whole of this is watered from streams, scarcely any from reservoirs or wells. The largest irrigated area is that north of Malheur and Harney lakes in Harney County. Simple methods are employed in irrigation, and the average cost of it per acre is low. In 1900 only 16.6 per cent. of the land area was included in farms. Of this 33 per cent. was improved. The average size of farms decreased until 1880, since which time, owing to the large additions made to ranges in the eastern part of the State, the average size has grown larger. It has, however, continued to decrease in the western counties.

The two leading crops are wheat and hay. The area devoted to wheat doubled between 1880 and 1900, the increase being almost wholly in the northeast counties, where one-half the crop is now grown. During the same period the acreage of hay and forage gained over threefold. Oats are grown principally in the Willamette Valley, and barley in the northeast counties. Oats have a large acreage. On account of the coolness of the nights, corn does not thrive, and but little is grown. Potatoes produce abundantly and are an important crop. Sugar beets are raised in Union County. The State ranks second in the production of hops, their culture being confined principally to the Willamette Valley. The region between the Cascade and Coast ranges, particularly Jackson and Douglas counties, has become noted for the production of fruit. The number of plum and prune trees in 1900 (2,517,523) was ten times that of 1890 and is only exceeded in California. The number of apple trees

(2,825,898) more than doubled in the same period. Other fruits grown include almost every variety common to the temperate zone.

The following table of acreages is self-explanatory:

CROP	1900	1890
Wheat	873,579	553,052
Hay and forage	731,823	467,061
Oats	261,406	218,736
Barley	60,375	37,722
Corn	16,992	12,101
Potatoes	30,035	17,965
Hops	15,454	3,130

Stock Raising. Horses, cattle, swine, and sheep are raised in numbers greater than is required to supply the home market. Large sections of the eastern portion of the State are fit only for grazing, and there are many large ranches in this region. The natural grasses cure on the ground and supply nutritive pasturage all the year. With the exception of 1860-70, each decade since 1850 has exhibited an increase in the number of every kind of domestic animal. The most significant increase from 1890 to 1900 was in cattle. The production of wool in that decade gained 83.8 per cent., while the average weight of fleeces increased from 6.3 pounds to 8.6 pounds, the latter record not being exceeded in any State. The following is a table of the leading holdings of stock:

	1900	1890
Dairy cows	122,147	111,156
Other cattle	577,856	407,492
Horses	287,352	224,962
Mules and asses	7,551	4,946
Sheep	1,961,355	1,780,312
Swine	281,406	208,259

Forest and Forest Products. The forests of Oregon are scarcely exceeded in extent and value by those of any other State. Except for limited districts already cleared, almost the whole of the region included between the Coast Range and the western slope of the Cascades is covered with forests, as is also a considerable portion of the eastern slope of the Cascades and the northeastern part of the State. The total woodland area has been estimated (1900) at 54,300 square miles, or 57 per cent. of the area of the State. Lane County has more timber than any other county, but is greatly exceeded by the corresponding area contained in the four counties in the northwest corner of the State. The coast forests are famous for their great density and the enormous growth attained by certain species of trees. Stands of 100,000 feet per acre for entire townships have been reported. The Douglas fir (red fir), which is one of the prevailing species of this section, sometimes attains a height of 300 feet. The average diameter of these trees cut is from 60 to 72 inches. Bridge timbers 110 feet in length and free from knots and other imperfections are obtained from these firs. The great strength of these timbers makes them very valuable for bridge use and also for spars or for framings for buildings. This species produces more commercial timber to the acre than any other tree on the continent. It is estimated that over five-sevenths of the timber is of this variety. The lumber product is constantly increasing in amount and value, the product for 1900 being worth $10,352,167. The pines and cedars are the most important species, both being large trees, and highly prized for finishing. The lumber cut in 1900 was estimated at 776,978,000 feet, as compared with 470,146,000 in 1890. The increase in value was proportionate. The remoteness of the region from the large lumber markets necessitates heavy freight expenditure and has tended to minimize the price of the product, and therefore limit its exploitation. The United States Government has recently set off over 4,500,000 acres as a forest reserve.

Manufactures. The manufacturing facilities are excellent. The natural resources include a supply of coal for fuel, and an abundant water power is attainable at The Dalles, Cascade Locks, and Oregon City. In the decade 1880-1890 there was for the first time a large development in the manufacturing industry, but the increase was only slight in the succeeding decade. In 1900 the value of manufactured products was $46,000,000, and 17,236 wage-earners, or 4.2 per cent. of the population, were then engaged in the industry. The forests are the most important source of raw materials, and the agricultural products rank second. The flouring and grist mill output amounted in 1900 to $6,364,000, being nearly a third greater than in 1890. The slaughtering and meat-packing output in the same year was valued at $1,638,480. Among other industries are the manufacture of woolen goods, canning and preserving of fish, car construction, and ship and boat building, including one establishment for the building of iron and steel vessels. About one-half of the total manufactured product of the State is accredited to Portland.

Transportation and Commerce. The Pacific Ocean, the Columbia River, and Snake River provide three sides of the State with the advantages of water communication. Along the coast there are nine inlets which offer harbor facilities. Most of the streams flowing into the Pacific are navigable for short distances. Large ocean-going vessels pass up the Columbia as far as Portland. Since the construction of a canal at Cascade Locks, river steamers can go as far as The Dalles, above which point the stream is again navigable. The Snake River is navigable beyond the point where it leaves the boundary. The Willamette, with the aid of canals, is navigable to Eugene, 150 miles from Portland. The developed portions of the State are adequately supplied with railroads, but the great arid region east of the Cascades is wholly without railroad accommodations, save in the northeastern corner. Oregon shows a remarkably low mileage, there being but 1.71 miles of railroad for every 100 square miles of territory. The total mileage was 1631 in 1899, or 43.59 miles for every 10,000 inhabitants. The Union Pacific and the Southern Pacific lines own the greater portion. The former, following the course of the Columbia, crosses the extreme northern portion of the State from east to west. The latter, following the course of the Willamette, crosses the western portion of the State from north to south. In the greater portion of eastern Oregon wagon roads are the only means of communication.

The State has United States customs districts and ports of entry: for southwestern Oregon, at Coos Bay, the headquarters of the coal and lumber trade in that section; for the Columbia

River, at Astoria; and for the Willamette, at Portland. The commercial importance of the water route is second only to that of the Mississippi. The commerce upon the Columbia and Willamette rivers has assumed great magnitude, due to the regular lines of steamers connecting with railways and canals around the falls. Smaller boats and rafting contribute largely to swell its volume.

Previous to 1868, the exports were mainly to the Sandwich Islands, Puget Sound, and San Francisco, and gold dust and ores formed three-fourths of the shipments. Since then the exports have reached almost every part of the globe, and consist largely of wheat and timber products. The foreign commerce of the State from 1890 to 1900 fluctuated between $5,600,000 and $15,000,000, about three-fourths being exports. The largest export countries were Great Britain, China, and Japan. The British East Indies and Japan supplied most of the imports. The State has a large interstate trade by rail and water, and a considerable portion of its products is distributed through San Francisco.

Banks. The Constitution of 1857 forbade any banks of issue, and also the incorporation of any banks by the Legislature. A private banking business was established in Portland in 1859. The First National Bank of Portland opened in 1865, being the oldest national bank west of the Rocky Mountains. The banking business remains unregulated. Since there is no banking law, banks, incorporated or private, are formed under the general corporation law, which limits the liability of the stockholders. Due to this condition, the national banks, being the more secure institutions, have preference over the State banks in popular confidence. The aggregate banking interests remained very insignificant until 1885, when there were only four State and nine national banks. Then came a sudden growth, and in 1894 there were more than forty banks. After the depression of 1893-95 the number somewhat declined. The condition of the banks in 1902 is shown in the following table:

	National Banks	State Banks	Private Banks
Number of banks	30	18	5
Capital	$2,420,000	$956,000	$50,000
Surplus	520,000	142,000	18,000
Cash, etc	2,586,000	334,000	21,000
Deposits	16,692,000	5,693,000	356,000
Loans	9,386,000	3,084,000	227,000

Government. The Constitution under which Oregon entered Statehood still continues in force. It was adopted by a vote of the people of the Territory in November, 1857. To amend it the amendment must pass two successive Legislatures and be approved by popular vote. While amendments agreed to by one Legislature are awaiting final decision, no other amendment can be proposed.

The Constitution authorizes any male citizen of the United States, twenty-one years old, and six months a resident of the State, to be a voter, and any like foreigner who shall declare his intention to become a citizen one year before an election and shall have been a resident of the State for six months. Oregon sends two members to the National House of Representatives.

Legislative. The Legislature consists of a Senate of not exceeding 30 members, elected for a term of four years, and a House of Representatives of not exceeding 60 members, elected for two years. The apportionment is by counties or groupings of contiguous counties, and is made every fifth year, a State census being taken every year ending in 5. General elections are held biennially on the first Monday of June of even years, and the Legislature convenes on the second Monday of the following September. The members of either House receive, besides mileage, $3 a day, but are limited to a $120 allowance for any session. Extra sessions are limited to 20 days' duration. Bills may originate in either House, except revenue bills, which must originate in the House of Representatives. In 1902 an initiative and referendum clause was added. By this, 8 per cent. of the voters may demand the submission of a law to the vote of the people, and 5 per cent. may demand that any law passed by the Legislature shall be submitted for popular approval.

Executive. The Governor's term of office is four years, and he is not eligible to this office more than eight years in any period of twelve. He has the right of veto, but his veto may be overridden by a two-thirds vote of each House. The people elect a Secretary of State (who is Auditor and Comptroller), and a State Treasurer, the term of office of each being four years. The former succeeds to the Governorship in case it becomes vacant. A State printer and a superintendent of public instruction are elected every four years.

Judicial. There is a Supreme Court of five judges, which number may be increased to seven. They have appellate jurisdiction, and are elected for six years. There are five circuit courts, presided over by one of the judges of the Supreme Court, having civil and criminal jurisdiction, and appellate jurisdiction from the county courts. There are county courts with one judge, elected for four years, who is also judge of probate. The Circuit Court judges are elected one-third every two years. There are also a United States District Court, and for Oregon, California, and Nevada, a United States Circuit Court. One or more justices of the peace are elected in every township or mining district, and municipal courts may be created. Judges of the Supreme Court can be removed by the Governor upon the joint resolution of two-thirds of the Legislature. The grand jury consists of seven men chosen by lot, five of whom must concur to find an indictment. Grand juries may be modified or abolished by the Legislature.

Local Government. Each county elects a clerk and a sheriff, who serve for two years. Attorneys are elected by districts composed of one or more counties. The Legislative Assembly may provide for the election of two commissioners to sit with the county judge when transacting county business in any or all the counties, or may provide a separate board for transacting such business. Other local officers may be provided for by law. Special laws may be enacted for municipal purposes.

Other Provisions.—The registration of voters is not required. New ballot laws, based on the Australian system, were adopted in 1891. The legal rate of interest is 8 per cent.; allowed by contract, 10 per cent. Women may practice law in Oregon, and a wife has sole control of property

owned by her at marriage or subsequently acquired. Chinamen are not allowed to hold real estate or work mining claims.

Finances. The Constitution prohibits the Legislature from contracting any State debt exceeding $50,000, or assuming the debt of any county, town, or corporation, except for purposes of war or to suppress an insurrection. Debts to the amount of $237,000 were contracted in 1864 in order to pay bounties to soldiers and for relief of discharged soldiers and officers. The bonds were rapidly redeemed and in 1870 only $90,000 were outstanding. In that year the Legislature authorized the issue of $200,000 for construction of a canal, to be redeemed from the proceeds of the sale of public lands. The Indian wars of 1877 and 1878 further increased the debt by about $175,000. Another debt was the 'indorsed and unpaid' warrants issued in 1873-75 and bearing 10 per cent. for construction of wagon roads and other purposes. These high interest bearing warrants were necessary because of the constitutional provision against bonds. Altogether about $350,000 of these warrants were issued. By 1878 the public debt amounted to $651,595; but the bonds and warrants were rapidly redeemed through a special tax on property. In 1886 the debt was reduced to $53,632 in bonds and warrants, which were advertised for but not presented for redemption. In 1903 the State had no funded debt except bonds to the amount of $2365 never presented and probably lost. The income of the State is derived mainly from a State tax and sale of public lands. In 1901 the total receipts were $1,772,808, of which 38 per cent. came from the State tax and 45 per cent. from sale of lands and payments on old sale-contracts and interest on the loans. The expenditures were $1,889,134, of which more than 50 per cent. went for educational purposes. Notwithstanding the deficit, the balance in the treasury on September 30, 1902, was $1,137,575.

Population. The population by decades was as follows: 1850, 13,294; 1860, 52,465; 1870, 90,923; 1880, 174,768; 1890, 313,767; 1900, 413,536. Oregon ranks 35th in population, and is exceeded by both of the other Pacific Coast States. The increase from 1890 to 1900 was 30.4, as compared with 20.7 for the United States. Over half of the population is located in the Willamette Valley. In 1900 the foreign-born numbered 65,748; Chinese, 10,397; and Indians taxed, 4951. The male sex exceeded the female by 52,000. The five places having a population exceeding 4000 each, contained together 27.6 per cent. of the population.

The Indians are collected largely on five reservations, namely, Grande Ronde, Klamath, Siletz, Umatilla, and Warm Springs. A limited amount of agriculture and stock-raising is carried on upon each of the reservations.

Cities. In 1900 Portland had 90,426 inhabitants; Astoria, 8381; and Baker City, 6663. Salem is the capital.

Religion. The leading denominations numerically are the Roman Catholic, Methodist Episcopal, Baptist, Disciples of Christ, Presbyterian, Congregational, Methodist Episcopal (South), Protestant Episcopal, and United Brethren.

Education. In 1900 only 3.3 per cent. of the population ten years of age and over were illiterate. The State Board of Education consists of the Governor, Secretary of State, and a superintendent of instruction. County superintendents are elected biennially, and officers of district boards every three years. Women are eligible to the office of school director, and widows with children to educate and owning taxable property in the district may vote in school meetings. Congress in 1848 gave Oregon sections 16 and 36 of all the public domain (3,387,520 acres) for public schools, 26 townships (500,000 acres) for a State university, and 90,000 acres for an agricultural college. From the proceeds of the sales of a portion of these lands an irreducible fund of $3,500,000 has been secured. The sparse settlement of a large part of the State makes the maintenance of schools difficult in many places. The Oregon law does not provide for district high schools, and rural communities are therefore without the advantages of secondary education. The length of school term, 123.9 days, is considerably below the average for the whole country. In 1899 there were 101,900 children between the ages of five and eighteen; the number enrolled was 88,485; the average attendance was 61,234. The public high schools numbered 15, and the private secondary schools 19. There are State normal schools at Monmouth, Drain, Ashland, Weston, and Gold Beach. The University of Oregon at Eugene was established in 1872. Pacific University and Tualatin Academy at Forest Grove are under Congregational control; Willamette University, Salem, is Methodist Episcopal; McMinnville College, McMinnville, Baptist; Portland University, University Park, Methodist Episcopal; Pacific College, Newberg, is a Friends institution; Philomath College, Philomath, a United Brethren; Corvallis College, Corvallis, Methodist Episcopal. Blue Mountain University is located at Lagrande. The State Agricultural College is at Corvallis. Willamette University gives instruction in law, and the University of Oregon has a law department at Portland, where also is situated the medical department of Willamette University. There is a successful Indian training school at Chemawa.

Charitable and Penal Institutions. There is a soldiers' home located at Roseburg, but the other State charitable institutions, in accordance with the requirements of the State Constitution, are located at the State capital. They are as follows: School for Deaf Mutes; Insane Asylum; School for the Blind; Boys' Reform School; and the State Penitentiary.

History. The accounts of the early exploration of the Pacific coast are conflicting and unreliable. The Spanish explorer Ferrelo possibly reached latitude 42°, the southern boundary of Oregon, in 1543, and the English flag was carried fifty or sixty miles north of this point in 1579 by Sir Francis Drake. The Spaniards Vizcaino and Aguilar reached 42° or just beyond in 1603. The fear of a Russian advance led Charles III. of Spain to order further explorations, and Perez in 1774 reached 55°, and on his return anchored in what has been identified by some as Nootka Sound. The next year Heceta, with Perez as second in command, observed the mouth of the Columbia, and a party landed at the modern Port Grenville, where several were killed by the Indians. One of the ships reached 58°. The English navigator Captain Cook in 1778 landed at Nootka Sound, which he so named. This English claim to possession was disputed by

the Spaniards in 1789, but Spain was forced to agree to give up exclusive claim to the region. (See NOOTKA SOUND.) The French navigator Lapérouse in 1786 sailed along the coast from 58° 37′ southward. The American claim began with the visit of J. Kendrick and Robert Gray, sent out by Boston merchants to seek for furs. The winter of 1788-89 was spent at Nootka. In 1791 Captain Gray returned, and on May 11, 1792, entered the mouth of the river Saint Roque, which he renamed the Columbia, from his ship. Another English expedition under Vancouver examined the coast in 1793. Fur traders entered the country in 1793, and in 1811 the Pacific Fur Company founded Astoria at the mouth of the Columbia. (See ASTOR, JOHN JACOB.) This was captured by the British, December 12, 1813, and renamed Fort George. It was restored to the United States in 1818, but abandoned by the owners. In 1824-25 Fort Vancouver was founded by John McLaughlin, chief factor of the United Hudson's Bay and Northwest Fur Companies, and he was practically Governor for many years.

The American claim rested upon the Louisiana Purchase in 1803 (the Spanish claim), and the discoveries of Captain Gray in 1792. From these grew the claim to all country drained by the Columbia. In 1805-06 Lewis and Clark explored much of the country. The northwestern boundary between the United States and Canada was fixed by the Convention of 1818 as the line of 49° from the Lake of the Woods to the Rocky Mountains. West of this point the territory was to be open to both parties, the United States and Canada, for ten years without prejudice to claims of either. (See NORTHWEST BOUNDARY DISPUTE.) By the Convention of 1827, ratified in 1828, joint occupation was continued indefinitely, but might be terminated by either party on twelve months' notice. The British were willing to concede 49° to the Columbia River, thence down it to the mouth, thus taking in a greater part of the present State of Washington, while the American claim, as before stated, was for all of the basin of the Columbia River, practically 42°-52°. The Oregon question occupied much of the attention of Congress after 1820, and the sentiment for demanding 'all of Oregon' grew. By the negotiations with Russia (1824-25) that country agreed to make no settlements south of 54° 40′, and the idea gained ground that this was the proper northern boundary. Immigration to the territory had begun in 1832; the Methodists founded a mission under Jason Lee in 1834, and the Presbyterians under Marcus Whitman in 1836. Every year after 1838 numbers of immigrants crossed the Rockies, and by 1845 the American population numbered nearly 3000. The settlement of the northeastern boundary had been unsatisfactory, and in 1844 a popular rallying cry of the Democrats was "Fifty-four forty, or fight." Several Senators favored war, but others held that the best method of gaining possession was by actual settlement, in which the Americans were far surpassing the British, who were hardly represented except by the trappers of the Hudson's Bay Company. It was finally agreed in 1846 that the boundary should be 49° to the channel between Vancouver and the mainland, thence down the middle of this channel, through the Straits of San Juan de Fuca to the sea. The story that Marcus Whitman (q.v.) in 1843 prevented the exchange of the northern part of the territory for fishing stations in Newfoundland is unfounded.

The American inhabitants in 1843 met and organized a Territorial government under an executive council. A Governor was chosen in 1845 and served until the organization of the region as a Territory of the United States. Oregon Territory, including the present Washington and much of Idaho, was organized on August 14, 1848, though the Governor did not arrive until the next year. The increase of population caused the inhabitants to hold a convention at Salem, August-September, 1857, which formed a State constitution and asked for admission. This instrument prohibited slavery, but forbade any free negro or mulatto "to come, reside, or be in the State, or hold real estate, or make any contract, or maintain any suit." The State was admitted February 14, 1859, with the present boundaries. Indian troubles were frequent from early times. In 1847 Whitman and twelve companions were massacred. There was constant trouble during the Civil War, and the Shoshone War (1866-68) and the Modoc War (1864-73) were serious. (See article MODOC.) All Indians are now confined within narrow reservations, or have been removed to Indian Territory. The Constitution has been seldom amended. The 'anti-negro' clause still stands, though, of course, inoperative. The State has been successful in securing large appropriations for improvement of rivers and harbors from the National Government. The Cascade Locks on the Columbia were the largest in the world when completed in 1896. The State has given its electoral vote for the Republican ticket except in 1868, and one vote in 1892, though usually by small majorities. In 1876 it was found that one of the Republican electors held a Federal office, and was consequently ineligible. The Democratic Governor issued a certificate to the leading minority candidate, but the two Republican electors filled the vacancy, and their position was sustained by the Electoral Commission. In 1892 the Democrats indorsed one Populist elector, and the vote that year was: Republican, 3; Populist, 1. Political squabbles have been frequent, notably in 1897, when the Lower House of the Legislature refused to organize on account of a contest for United States Senator.

GOVERNORS OF OREGON.

PROVISIONAL.

George Abernethy	1845-49

TERRITORIAL.

Joseph Lane	1849-50
Knitzing Pritchett (acting)	1850
John P. Gaines	1850-52
Joseph Lane	1853
George L. Curry	1853
John W. Davis	1853-54
George L. Curry	1854-59

STATE.

John Whiteaker	Democrat	1859-62
Addison C. Gibbs	Republican	1862-66
George L. Woods	"	1866-70
Lafayette Grover	Democrat	1870-77
S. F. Chadwick (acting)	"	1877-78
William W. Thayer	"	1878-82
Zenas F. Moody	Republican	1882-87
Sylvester Pennoyer	Democrat-Populist	1887-95
William P. Lord	Republican	1895-99
Theodore T. Geer	"	1899-1903
George E. Chamberlain	Democrat	1903—

BIBLIOGRAPHY. Bulfinch, *Oregon and Eldorado* (Boston, 1866); Moseley, *Oregon: Resources, Climate, Products* (London, 1878); Nash, *Two*

Years in Oregon (New York, 1882); Barrows, *Oregon, the Struggle for Possession* (Boston, 1884); Nixon, *How Marcus Whitman Saved Oregon* (Chicago, 1895); Mowry, *Marcus Whitman and the Early Days of Oregon* (New York, 1901); Bourne, "The Whitman Legend," in *American Historical Review* (ib., 1901); Bancroft, *History of the Northwest Coast* (San Francisco, 1884); id., *History of Oregon* (San Francisco, 1886-88); Gray, *History of Oregon, 1792-1849* (Portland, Ore., 1870); Nicolay, *Oregon Territory* (London, 1846), a clear statement of the British position; Greenhow, *History of Oregon and California* (Boston, 1844).

OREGON. A city and the county-seat of Ogle County, Ill., 99 miles west of Chicago; on the Rock River, and on the Chicago, Burlington and Quincy Railroad (Map: Illinois, C 2). It has a public library with over 2400 volumes. Good water power is furnished by the river; and there are manufactures of pianos, street sprinklers, flour, foundry and machine-shop products, etc. Oregon is an attractive summer resort. Population, in 1890, 1566; in 1900, 1577.

OREGON, University of. A coeducational State institution at Eugene, Ore., founded in 1872 and opened in 1876. It forms an integral part of the public system of the State. It comprises the University Academy; the College of Literature, Science, and the Arts, with a school of commerce, and courses in law, journalism, and teaching; the College of Science and Engineering, with courses preparatory to medicine and dentistry; the School of Music; the Graduate School; and the schools of law and medicine, the last two at Portland. Admission to the university is based on examination or on certificates from accredited schools. The university had in 1902 an attendance of 470, 71 instructors, and a library of 15,500 volumes. The productive funds amounted to $200,000, and the income to $59,700.

OREGON BROOK-TROUT. The common brook-trout of the tributaries of the lower Columbia, and of coastwise streams of Oregon and Washington, a variety (*Iasconi*) of the rainbow trout (q.v.). The Dolly Varden trout of the same region is sometimes called the Oregon charr.

OREGON CITY. The county-seat of Clackamas County, Ore., 15 miles south-southeast of Portland; on the Willamette River, and on the Southern Pacific Railroad (Map: Oregon, C 4). It is developing as an industrial centre, its manufactures, which include paper and pulp, woolen goods, flour, lumber, soap, etc., being promoted by the immense water power derived from the falls of the Willamette, 40 feet in height, which are utilized also as a source of electrical power. The city is at the head of deep-water navigation on the river, but vessels pass above the falls by means of a system of locks. There are municipal water-works. Population, in 1890, 3062; in 1900, 3494.

OREGON QUESTION. The name given in American history to the dispute between the United States and Great Britain over the delimitation of their possessions on the Northwest coast, leading to the determination of the present boundary. See Oregon, paragraph *History:* Northwest Boundary Dispute.

OREGON RIVER. A river in North America. See Columbia River.

OREGON ROBIN. A thrush (*Merula nævia*) of the Columbia River Valley and northward, which is closely related to the Eastern robin (*Merula migratoria*), but very different in colors. It is dark bluish slate above, and orange-brown below, with a line of black from the bill backward below the eye and along the side of the neck, whence it curves forward into a broad, crescentic band across the breast. The bird breeds in British Columbia and Alaska, makes a strong nest in bushes, and lays eggs colored light greenish blue, and distinctly marked and spotted with blackish brown. It has a sweet song.

OREGON SNOWBIRD. A junco (*Junco Oregonus*) common in the Northwestern United States and Canada. It differs from the common Eastern junco (q.v.) in the blacker and more sharply defined hue of the head and neck, the absence of dark color under the wings, and the square patch of rufous brown on the upper part of the back. As in other juncos, white feathers appear in the tail. The male of this species has the second tail feather mostly white and the third partly so near the tip. The adult female's plumage differs from that of the male in being prevailingly brown.

OREGON STURGEON. The white sturgeon of the Pacific Coast. See Sturgeon.

OREGON TRAIL, The. A narrative of travel by Francis Parkman (1849). It is the account of a trip to the far West which he made in 1846, and first appeared in the *Knickerbocker Magazine* in 1849 as "The California and Oregon Trail."

O'REILLY, Count Alexander (c.1722-1794). An Irish soldier in the Spanish service. At an early age he went to Spain, where he entered the military service. After serving in Italy against the Austrians he entered their service in 1757, and fought in two campaigns against the Prussians. In 1759 he entered the French Army, but soon afterwards was induced to return to Spain, and in the campaign of 1762 against Portugal earned promotion to the rank of brigadier-general. He was made major-general, and was appointed Governor of Havana. There he rebuilt the fortifications which had been demolished by the British. In 1769, appointed Governor of Louisiana and sent with a large force to reduce the rebellious French colonists, he arrested and tried the leaders of the revolution, and had some of them shot, but having thus demonstrated his master's power, he then devoted himself to winning the affections of the colonists by the affability of his demeanor and the liberality of his policy. In 1770 he returned to Spain, where he was made Governor of Madrid. On the death of General Ricardos he was appointed commander of one of the armies operating against the French, and died while on his way to the frontier.

O'REILLY, John Boyle (1844-90). An Irish-American poet and journalist, born at Dowth Castle, county Meath, Ireland, June 28, 1844. He studied at a private school, learned to set type, and became a newspaper reporter. At the age of eighteen he went to London as an agent of the Fenian Society, and in 1865 enlisted in

the British Army for the purpose of inducing Irish soldiers to revolt. He was detected in 1866, tried for high treason, and sentenced to be shot, but the sentence was commuted to penal servitude for twenty years. In April, 1867, with the help of the Rev. Patrick McCabe, he escaped in a boat from Bunbury, Western Australia, was rescued by the *Gazelle*, an American whaler, and carried to the United States in November, 1869. He settled in Boston, and devoted himself to literary work and public activity. In 1870 he became editor of the *Pilot* and remained in that position till his death at Hull, Mass., August 10, 1890. He was the founder of the Papyrus Club of Boston, and was highly esteemed, especially by men of his own race, for his talents, social qualities, and his loyalty to the Fenians. His verse includes *Songs of the Southern Seas and Other Poems* (1873); *Songs, Legends, and Ballads* (1878); *Statues in the Block and Other Poems* (1881); *America* (1882); *In Bohemia* (1886). Volumes of prose are: *Moondyne: A Story from the Under World* (1879), a tale of penal life; *The Irish Question* (1886); *The Ethics of Boxing and Manly Sport* (1888); and *Stories and Sketches* (1888). Consult the *Life of John Boyle O'Reilly* (Boston, 1891), by James Jeffrey Roche.

O'REILLY, Miles. The pseudonym of the American soldier and poet Charles Graham Halpine (q.v.).

OREJONE, ō'rā-hō'nā (Sp., Big Ear). A name applied by the Spaniards to several unrelated tribes on account of their custom of stretching or distending the ear by heavy pendants. The principal tribe thus known, properly called *Coto*, ranges between the Putumayo and Napo rivers, in territory claimed both by Ecuador and Colombia. They are naked savages of repulsive appearance and fierce disposition, although carrying on some trade in hammocks and poison. Their huts are without doors, entrance being effected from the roof. They use stone hatchets and poisoned arrows, and stretch their ears, by the insertion of wooden plugs in the lobes, until they hang down to their shoulders. Their language is said to be related to the Ticuna.

Another tribe of the same name was described by the missionary Nicolas in 1739 as living in the ancient Province of Santa Marta, now the province of Magdalena, Colombia. They called themselves *Tomaco*. They were also fierce and brutal savages, going entirely naked, with bodies anointed with gum, and their long hair hanging loosely, sometimes crowned with feather turbans. Both men and women wore gold pendants in their ears and noses. They cultivated corn, but depended chiefly upon hunting for subsistence, using poisoned arrows. They were also accused of cannibalism. They were bitterly hostile to the Spaniards, very few of them having ever been brought under mission influence, and have probably long since disappeared.

OREL, ār-yōl'. A government of Central Russia, bounded by the governments of Smolensk, Kaluga, and Tula on the north, Voronezh on the east, Voronezh and Kursk on the south, and Tchernigov on the west (Map: Russia, E 4). Area, 18,060 square miles. It has a somewhat hilly surface intersected by numerous ravines and river valleys and sloping generally toward the west. The chief rivers are the Don (with its tributary the Sosna), the Oka, and the Desna.

The climate is moderate, the temperature averaging 45° F. at Orel, the capital. In the eastern part, where there is an abundance of black soil, agriculture is the principal occupation, and yields considerable quantities of grain for export and hemp for manufacturing. In the west the soil is generally sandy and sterile, and agriculture is only of secondary importance. Thousands of the peasants of that section annually go for a season of work to Saint Petersburg and Moscow, and especially to the southern parts of Russia. Stock-raising is important, and the Orel horses are classed among the best in Russia. In the forest regions timber, tar, and pitch are produced. The house industry is but slightly developed. The chief manufactures are iron rails, glass, oil, flour, hemp products, etc. Population, in 1897, 2,054,749, chiefly Great Russians.

OREL. The capital of the government of the same name in Central Russia, situated on the Oka, at its confluence with the Orlik, 238 miles south of Moscow, and at the junction of three railway lines (Map: Russia, E 4). It is built mostly of wood. It contains three gymnasia, a *Realschule*, a corps of cadets, a theological seminary, and a meteorological station. The chief products are candles, ropes, oil, and flour. The town was founded in 1564 as a frontier fortress against the Crimean Tatars. Population, in 1897, 69,858.

O'RELL' Max. A name assumed by Paul Blouet (1848-1903). A French satirist. He served in the Franco-German War (1870), went to England as a newspaper correspondent in 1872, and taught French at Saint Paul's School (1876-84), using experiences gathered then, and during a visit to the United States, for *John Bull and His Island* (1883); *John Bull's Daughters* (1884); *Friend MacDonald* (1887); *Jonathan and His Continent* (1889); *A Frenchman in America* (1891); *English Pharisees and French Crocodiles* (1892); *John Bull and Co.* (1894); and similar books that have had a wider circulation among English peoples than in France. His writings, first published in French and translated into English by his wife, are humorous and often truthful, but as studies of nations they are marked by no very careful investigation or depth of thought.

ORELLANA, ō'rā-lyä'nä, Francisco (-1545). The discoverer of the course of the Amazon River. He was born in Trujillo, Spain, and came to Peru in 1535. In 1537 he had a share in the founding of Guayaquil. In 1540 he accompanied Gonzalez Pizarro as second in command on an expedition across the Andes into the country beyond, which was reported to abound in gold, silver, and cinnamon. After many hardships and misfortunes the expedition reached the junction of the Coca and the Napo rivers. Their supplies being exhausted, Orellana with 50 men was ordered to sail down the Napo in search of provisions and signs of treasure. He descended the stream to its junction with the Amazon, but instead of returning proceeded down the great river in a vessel which he constructed for the purpose. The voyage to the mouth of the Amazon lasted nearly eight months and Orellana's party underwent severe privations. Many deaths occurred

from skirmishes with the natives, and mutinies broke out among the crew, which only the commander's firmness quelled. Orellana reached the coast in August, 1541. From the mouth of the river he sailed to the island of Cubagua, in Venezuela, and thence to Spain, carrying glowing accounts of El Dorado, and embellishing his story with descriptions of a marvelous race of female warriors, of whom the natives, as he understood them, had told him, and who were named from the classical analogy, Amazons. Gold there was in such plenty that the roofs of the temples were made of that metal. The King of Spain granted Orellana extensive possessions and a commission to colonize El Dorado. He set out with four ships and 400 men in May, 1544, but lost one ship and 150 men before reaching Teneriffe. He arrived at the mouth of the Amazon, but his fleet was wrecked, and he died shortly after of malarial fever. An account of Orellana's first voyage was written by Gaspar de Carvajal.

ORELLI, ō-rĕl'lē, Kaspar (1787-1849). A classical scholar, born at Zurich. He studied in the *Carolinum* at Zurich, and in 1806 was ordained as a clergyman. He spent some years as a pastor at Bergamo; and while there published, in 1810, two parts of a work entitled *Beitrage zur Geschichte der italienischen Poesie*. In 1811 he became a teacher in the cantonal school at Chur; in 1819 professor of eloquence and hermeneutics in Zurich; and after the foundation of the Zurich High School, in which he took an active part, he was one of its chief instructors. Orelli edited many classical authors with great learning, taste, and acute discrimination; in particular, his editions of Horace (Zurich, 1837-38), Tacitus (Zurich, 1846-47), and Cicero (Zurich, 1826-31) deserve mention; also an *Onomasticon Tullianum* (Zurich, 1836-38), executed in association with Baiter, and an *Inscriptionum Latinarum Selectarum Collectio* (2 vols., Zurich, 1828; 3d vol. with indices, by Henzen, ib., 1856). There is a fourth edition of Orelli's *Horace*, with a lexicon (Berlin, 1886-92).

ORENBURG, ōr'en-bûrg'. A government of Russia partly in Europe and partly in Asia, and bounded by the Government of Perm on the north, Tobolsk and Turgai on the east, Uralsk on the south, and Samara and Ufa on the west (Map: Russia, J 4). Area, about 73,900 square miles. It is mountainous in the centre and the north, being traversed by the Ural Mountains (q.v.) and their offshoots. It slopes toward the west, south, and east. The eastern and southern parts have the character of a steppe. The region belongs mainly to the basins of the Ural and Tobol. Lakes are very numerous, and some of them contain extensive deposits of salt.

The climate is healthful, but somewhat dry in the southeast. The average annual temperature at Orenburg, the capital, is 38.5° F. Orenburg is noted for its mineral deposits, which include gold, silver, copper, iron, platinum, and salt. Coal has also been discovered near Ietsk in the south. Gold, copper, iron, and salt are obtained on a large scale, the first being found mainly in the eastern slopes of the Ural chain. The mountainous region in the centre is well wooded, while the eastern steppe is mostly barren. The natural conditions are favorable for agriculture, but the soil has been to some extent exhausted by the wasteful methods which usually characterize agriculture in new countries. About three-sevenths of the total area of the district belongs to the Orenburg Cossacks, the original Russian settlers of the region, who are still maintained on a military basis and are very prosperous.

Stock-raising is extensive, especially among the Bashkirs. Animals and animal products are among the leading exports. The Bashkirs are particularly known for their kumiss, which forms an essential item in their diet. Manufacturing industries are as yet undeveloped. The best known products of the house industry are various felt products, and the 'Orenburg shawls,' prepared from goats' wool and largely exported. There is an extensive trade carried on with the Kirghiz of the steppes. Population, in 1897, 1,609,388, only about 70 per cent. Russians. The remainder are Bashkirs and other Mohammedans.

ORENBURG. The capital of the Government of Orenburg, in Eastern Russia, on the right bank of the Ural, 988 miles by rail southeast of Moscow (Map: Russia, J 4). It is a well-built city with an old fortress, an arsenal, two gymnasia, a corps of cadets, a seminary for priests and for teachers, a theatre, and a museum. In the extensive municipal abattoir great numbers of cattle are slaughtered annually for export purposes. A little over a mile from the city is the 'barter house' —an extensive bazaar in the shape of a fortress where herds of cattle are brought from the East and exchanged for manufactured articles. The barter trade, which was formerly very extensive, has decreased considerably since the construction of the Trans-Caspian Railway. Orenburg exports large quantities of frozen meat, tallow, hides and skins, butter, cheese, wool, and other animal products. The town was founded at the confluence of the Or with the Ural in 1735 and removed to its present site in 1742. It withstood a siege by Pugatcheff in 1773. Population, in 1897, 72,740, including 13,000 Mohammedans.

ORENSE, ō-rĕn'sā (Lat. *Aquæ Urentes*, hot springs). The capital of the Province of Orense, in Galicia, Northwestern Spain (Map: Spain, B 1). It is situated on the left bank of the Miño, in a mountain valley having a cloudy and stormy climate. The river is here crossed by a fine bridge of seven arches built in 1230, but the town itself has few features of interest. It has a Gothic cathedral, which is hemmed in by houses and narrow streets. The high school occupies a handsome building, and there are, besides, a seminary, a normal school, and the provincial library. The town manufactures leather and chocolate, and there are flour mills and iron foundries. At the foot of the hill on which the town lies are the hot springs of Las Burgas. Population, in 1887, 14,168; in 1900, 15,258.

O'REODAPH'NE (Neo-Lat., from Gk. ὄρος, *oros*, mountain + δάφνη, *daphnē*, laurel). A genus of trees (now called Ocotea) of the natural order Lauraceæ, sometimes called mountain laurel. The fruit is succulent, partly immersed in the deep thick calyx. *Ocotea opifera* is a native of the lower Amazon countries. A volatile oil obtained from the bark is used as a liniment, and when kept for a short time deposits a great quantity of camphor. *Ocotea cupularis*

(*Mespilodaphne cupularis* of some botanists) is a very large tree with strong-scented wood, the bark of which yields the cinnamon of Mauritius. It grows also in Réunion and Madagascar. *Oreodea fœtens*, a native of the Canaries, has wood (til-wood) of a most disagreeable odor. *Oreodea bullata*, found at the Cape of Good Hope, is also similarly remarkable and is locally called stink-wood. It is hard, durable, beautiful, takes an excellent polish, and is used in ship-building.

O'REODON (Neo-Lat., from Gk. *ὄρος*, *oros*, mountain + *ὀδούς*, *odous*, tooth). An extinct artiodactyl ungulate mammal, fossil remains of which are found in such great abundance in the Oreodon beds as to indicate that these animals roamed in extensive herds over the grassy plains of Colorado, the Dakotas, Nebraska, and Wyoming during Miocene times. The animal was of the size of the modern peccary, with four hoofed toes on each foot, and a very long slender tail. Leidy called it a 'ruminating hog.' An allied genus, Eporeodon, twice the size of Oreodon, is found in the Miocene deposits of the Pacific Coast, and other ancestral forms are found in the Eocene beds.

ORESTES, ô-rĕs'tēz (Lat., from Gk. *Ὀρέστης*). In Greek legend, a son of Agamemnon and Clytemnestra. According to the *Odyssey*, he was sent from Mycenæ by his mother when she yielded to the seductions of Ægisthus. Brought up at Athens, he returned eight years after the murder of his father by Ægisthus, slew the murderer, and recovered the kingdom. The death of Clytemnestra is implied, but there is no allusion to her murder by her son. In the later poets, apparently through the influence of Stesichorus, this became the prominent feature of the story, which was then closely connected with the worship of the Delphian Apollo, as a purifier from the guilt of blood. The theme was treated by the three great tragedians, by Æschylus in the Orestan trilogy, by Sophocles in the *Electra*, by Euripides in the *Electra*, *Orestes*, and *Iphigenia Among the Taurians*. The versions vary in the details according to the dramatic ideas which influenced the writers. After the murder of Agamemnon, Ægisthus and Clytemnestra ruled over Mycenæ, or Argos, without opposition. Electra, sister of Orestes, was harshly treated because she still mourned her father and longed for vengeance on his murderers. Orestes in Phocis hesitated to return until ordered by Apollo to revenge his father. He therefore went to the palace, revealed himself to Electra, by a stratagem secured admission and slew his mother, Clytemnestra, and her paramour. He then sought purification at Delphi, and in one version found it. Another story told how the Erinnyes (or Furies) pursued the matricide, and even Apollo could not help him, but sent him to Athens, where Athena established the high court of the Areopagus to hear the case. Orestes was acquitted by a tie vote, and the Furies were appeased by the establishment of their worship as the Eumenides at Athens. Euripides added the story that after the trial Orestes was freed only by voyaging to the Tauric Chersonese for the image of Artemis, thus freeing his sister Iphigenia (q.v.). The *Orestes* of Euripides has a unique version of a trial at Argos and condemnation. After his release from the Furies Orestes reigned at Argos or Sparta, and married Hermione, daughter of Menelaus, after killing at Delphi Neoptolemus, son of Achilles, who also claimed her hand. Scenes from this legend are common on vases and sarcophagi.

ORESTES AND ELEC'TRA. (1) The title commonly given to a marble group in the Villa Ludovisi, Rome. It is the work of the sculptor Menelaus and probably represents Theseus and Æthra, or Telemachus and Penelope. (2) An affecting group in the Museo Nazionale, Naples. It is in the archaic style revived by Pasiteles toward the end of the Roman Republic.

O'REUS (Lat., from Gk. *Ὄρεως*). A later name for the ancient Euboean city Histiæa (q.v.).

OREX'IN (from Gk. *ὄρεξις*, *orexis*, desire, appetite, from *ὀρέγειν*, *oregein*, to reach out, desire). A derivative of chinoline, chemically phenyl-di-hydro-quinazoline-hydrochlorate. It is a grayish, odorless, crystalline powder, with a bitter, pungent taste. It is soluble in water and in alcohol. It is used to increase the appetite by increasing the secretion of gastric juice, and should not be employed if there is actual disease of the stomach.

OR'FE (from Lat. *orphus*, from Gk. *ὄρφος*, *orphos*, sort of perch). A golden variety of the ide, bred for keeping in aquariums. See IDE.

ORFEO ED EURIDICE, ôr-fā'ô ĕd ā'ū-rē'-dē-chā. The title of an opera by Gluck, with libretto by Calsabigi. It was presented in 1762 in Vienna and in 1774 in Paris with a French libretto by Moline.

ORFILA, ôr'fē'lä', MATTHIEU JOSEPH BONAVENTURE (1787-1853). A French chemist, physician, and toxicologist. He was born at Mahon, in Minorca, and studied medicine at Valencia and Barcelona, receiving the degree of doctor of medicine in 1811. He immediately began a private course of lectures on chemistry, botany, and anatomy, and soon became a well-known and successful practitioner. In 1813 he published a treatise on poisons which materially increased his fame; in 1816 he became Court physician; in 1819 he was created a citizen of France, and became professor of medical jurisprudence; in 1823 he was transferred to the chair of chemistry, to which was added in 1831 the deanship of the faculty. From 1834 he was a member of the council of public instruction. He organized a clinical hospital, founded a new botanical garden, and a museum of comparative anatomy, which is now known by his name. He died in Paris. Orfila is regarded as the founder of the science of toxicology, and his great work on the subject, *Traité des poisons tirés des regnes minéral, vegetal et animal*, or *Toxicologie generale* (Paris, 1813), gained him world-wide recognition. His other works are: *Elements de chimie appliqués à la medecine* (1817; 8th ed. 1851); *Traité de médicine légale* (1823-25; 4th ed. 1847); *Memoires sur plusieurs questions medico-légales* (Paris, 1839); and *Recherches sur l'empoisonnement par l'acide arsenieux*, etc. (ib., 1841).

OR'FORD, Sir ROBERT WALPOLE, first Earl of. An English statesman. See WALPOLE, SIR ROBERT, first Earl of Orford.

ORGAN (AS. *organ*, *organa*, from Lat. *organum*, from Gk. *ὄργανον*, *organon*, instrument, organ; connected with *ἔργον*, *ergon*, work, Av. *varez*, to work, Goth. *gawaúrki*, OHG. *werch*, *weral*,

Gr. *Work*, AS. *weorc*, Eng. *work*). In biology, any part of a plant or animal that has a definite work to perform for the good of the whole being. In the possession of organs living creatures differ from mineral substances; consequently the former are called 'organisms,' and are said to be composed of organic matter, whereas the latter are morganic. Even in the lowliest one-celled creatures organs make their appearance. The nucleus may be regarded as the first or oldest organ in organisms. The cytoplasm as well as nucleoplasm must, however, be regarded as composed of a complex of primitive organs which we cannot indeed see, but with whose behavior we are acquainted. These are the 'biophores' or microsomes. In some of these organs, also called 'organoids,' seems to reside the control of the nutrition; in others that of locomotion; in others that of sensation. Visible structures are also developed, such as a framework and often cilia. Thus even in its most primitive form protoplasm is already possessed of many organs; it is *organized*. Of the origin of the most primitive organism, of the source of this fortunate concurrence of mutually operating organs, we are totally ignorant.

Although even the simplest protoplasm is organized, organization becomes more complex in the higher forms. The organs become more numerous and have different ranks. There are the organs of gross anatomy, such as the eye, the stomach, heart, and the limbs, tissues, etc., which are complexes of organs of a lower rank, and are in turn made up of the unit organs—the cells. All cells have the organized structure of protoplasm. The essence of organization is division of labor. In a great factory each worker does a single stage of the work, so that if one drops out the work of the others is stopped. In such a factory, therefore, extreme division of labor is found, on the whole, to be immensely advantageous to the amount and quality of the work done; so in the organism. Important is the fact that, despite the extreme division of labor in the organism, the whole rules over the parts. So that even if an organ fails to perform its function completely, the organism may still survive through a regulative capacity in the rest of the organism.

Undeveloped and Vestigial Organs. There are certain organs in nearly all animals which attain little development—some seem, indeed, to be retrogressively developing. This retrogression may take place in the development of the individual or of the race, and seems to be due to disuse. The organs that are becoming degenerate in the race appear in a more or less rudimentary condition even in the embryonic life of the individual. They may later disappear in the individual development or long persist as vestigial and apparently useless structures. Organs occasionally occur which are imperfect, incomplete in structure, as a result of faulty or arrested development. Thus rare cases of persistent gill-slits occur in man, the two halves of the upper lip fail to fuse, or the heart is imperfect in construction. See Disuse.

Correlation of Organs. Certain organs of the body are physiologically or morphologically so interdependent that any change in the one brings about certain changes in the others. Such close relations between organs we call correlation. For example, such a relation exists between the length of the right and left arms, and between the length of the arm and the stature.

Symmetry of Organs. Throughout all the animal kingdom, an external bilateral symmetry of organs very generally prevails in the two sides of the body. These similar sides are called 'antimeres.' This is the case in man and in all vertebrates. In the internal organs of the higher vertebrates, on the other hand, the two sides of the body present great diversities in the circulating, digestive, and other systems. This asymmetry has evolved from the symmetrical condition characteristic of the lower vertebrates. Even the external organs of the higher vertebrates, although similar on the two sides, are very imperfectly so. In the two hands, for example, the blood-vessels, nerves, and finger-points of one differ from those of the other. In Mollusca bilateral symmetry sometimes exists, and is sometimes entirely lost, the one side remaining relatively undeveloped. In the Arthropoda the symmetry is in general as perfect as in vertebrates, and in the internal structure even more so. In the Echinodermata and Coelenterata radial symmetry prevails, i.e. there are more than two similar antimeres (usually five) grouped around a chief axis. In sea-anemones there are usually five of these antimeres; in Hydromedusæ four. In the vegetable kingdom a radial symmetry appears in the regular distribution of sepals, petals, stamens, etc., around the centre of the flower; and also in the arrangement of organs around the chief axis of the plant. See Homology; Homoplasy; Morphology.

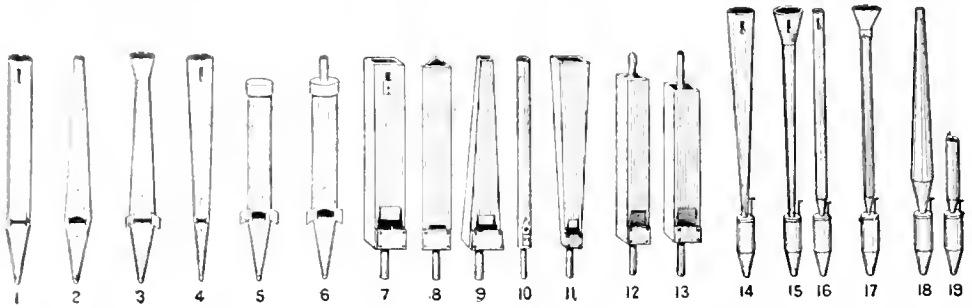
ORGAN. A wind instrument of large dimensions, whose earliest history cannot be exactly traced, though it is safe to assume that its predecessors were the bagpipes and Pan's pipes. The *organum hydraulicum* of Ctesibius, a native of Alexandria (c.250 B.C.), has been described by his pupil, Heron, also of Alexandria, from whom it would appear that organs were made in Greece and Italy with wind generated by bellows (air pumps), and also by means of water pressure. There is also extant a description (Greek) of an organ belonging to Julian the Apostate (fourth century A.D.), and there are other examples from Cassiodorus and Saint Augustine. Further data are obtained from ancient reliefs, representations, and accounts which would seem to indicate that the instrument was known in the West even before the Emperor Constantine (Copronymos) sent a gift of one to King Pepin in 757. These early instruments were naturally imperfect, rarely possessing more than from eight to fifteen pipes; while the keyboard consisted of small upright plates made of wood which the performer pressed upon. The sound of the pipe continued until the key plate was restored to its former position. The organ is said to have been first employed in the church during the time of Pope Vitalian I. (c.666 A.D.). Pepin placed the Constantine organ in the Church of Saint Corneille at Compiègne, and Charlemagne had one made at Aix-la-Chapelle, a model of the one at Compiègne. Caliph Harun al-Rashid presented Charlemagne with an organ built by Giafur, an Arab. In Europe at this period the organ-builders of Venice were considered the best, but in the following century both the French and the Germans made rapid strides. The great organ in Winchester

Cathedral, described by the monk Wulstan, was the first instrument of importance erected in England. It is described as having been operated by "two brethren of concordant spirit," and its tone is said to have "reverberated and echoed in every direction so that no one was able to draw near and hear the sound, but had to stop with his hands his gaping ears." Among the Anglo-Saxons of the tenth century the title 'Bumbulum' was applied to the organ. Up to this time the instrument was worked by means of slides, which, according as they were opened or closed, admitted wind to the pipes.

The modern keyboard (q.v.) grew out of the levers of this period, which have been well described as resembling those used by a railway signal switchman. The organ already mentioned at Winchester is said to have had four hundred pipes and two claviers, each of which had twenty keys (the compass of the Guido monochord), and also had ten pipes for each key, which were further reinforced in the octave and double octave. The special development of the twelfth century seems to have been the division into registers of the pipe-work, which, with its complicated mechanism, caused a great increase in the size of the instrument and made necessary such large keys that they had to be struck with the fists or elbows. The introduction of reed pipes occurred in the fifteenth century, subsequent to the invention of pedals in Germany about 1350. Improvements were also made in the keyboard so that fingers could be used instead of fists. Organ-building now became a regular trade. The father of the modern organ-building craft, so far as any authoritative account is concerned, was Albert van Os, who flourished in the first half of the twelfth century, and who is supposed to have been the inventor of pedals, although the idea is also attributed to Ludwig van Valbeke, of Brabant, and also to a German named Bernhard. Van Os built the celebrated organ of Saint Nicholas Church at Utrecht. From this time also dates the influence of the organist on the builder, for improved instruments made possible the skillful organist, and his reflex influence discovered and developed further improvements and possibilities in the instrument. Coming to the time of Bach, we find the organ the most thoroughly developed and possibly the most important musical instrument of the period. Saxony, which may be described as the birthplace of the magnificent instrument of to-day, boasts of over two hundred organ-builders between 1359 and 1780, including such world-famous workmen as the Silbermanns, Hildebrand, Gabler, Sommer, and Herbst. The difference between the French and the German systems had an important bearing on the development of the various pipes. The French gave the reeds to the instrument, while the Germans invented the gamba family and brought the small wooden pipe tone to great perfection. The next great and comparatively recent discovery was a method for equalizing the wind pressure, by the introduction of inverted ribs in the upper reservoirs of the bellows, an improvement which made possible a constant wind pressure and consequently an evenness of tone which had hitherto been unattainable. The 'hauptwerk' and 'oberwerk' of Germany correspond to the 'great' of the modern English and American organ; and similarly the 'brustwerk' is the equivalent of the English 'swell.' The 'ruckpositiv' corresponded to the English 'choir' or 'chair' organ. A distinctive feature of the German organs was their 'echo' organ, which contained stops reduplicating either the whole or the upper portion of some of the stops on the main organ. As they were built in an inclosed box, they produced the effect of distance. An English maker, Abraham Jordan, invented the simple contrivance of shutters about 1720, an invention which increased the tone of the echo stops and was practically the first real 'swell.' Other countries were somewhat slow to avail themselves of the English invention, for, according to Burney, no trace of it could be found anywhere on the Continent except in the Michelkirche at Hamburg, and even there it was so small as to be almost ineffective. In France the disposition of the stops in classes seems to have been the same as in Germany, Holland, and England. The organ of Saint Roch (1750) had four manuals, of which the great and choir communicated by means of a spring. The third manual was for the reed stops, and the fourth or upper for the echoes. The spring of communication was the predecessor of the modern coupler. Coming down to the nineteenth century, we find the efforts of the builders directed to still further improvements in the wind apparatus and the keyboard. An Englishman, C. S. Barker (1806-79), noticed that in the great organ at York Minster several pounds' pressure was necessary to force down any single key. In the search for a remedy the principle of the hydraulic press occurred to him, with the result that he devised a movement or mechanism by which the action was set in motion by the expansive power of compressed air, so that the key, instead of being a lever which had to move a complicated mechanism of back falls, rollers, springs, etc., became a valve lever whose only function was to admit or cut off a small quantity of air in order to obtain a result greater than had been possible before. Barker offered his discovery to the celebrated builders, Messrs. Hill, of London, when they were at work on the organ in the Birmingham Town Hall, but they rejected it. The equally celebrated Parisian builder, Cavaillé-Coll, was next approached, and promptly applied it to the organ of Saint Denis. Thus the three great inventions of the swell, the bellows, and the pneumatic lever belong to the English school of organ-building.

The Modern Organ. The modern organ is ordinarily several organs in one, the number varying according to the size of the complete instrument. In a large organ the order of claviers would be as follows: echo organ, solo organ, swell organ, great organ, choir organ, and pedal organ. The *great organ* contains the pipes of largest scale and most powerful tone, and does not ordinarily contain any soft stops unless the manual is required to serve as a choir as well as a great organ. The *swell organ* is that part of the instrument which is inclosed in a box. The pipes are usually of smaller scale than are those of the great organ, and where there are only two manuals, it usually includes several soft and fancy registers, and also the majority of the reed stops. The *choir organ* is used for soft accompaniment, and is made up largely of flute-tone stops, with possibly one or two reed stops. In the best organs they are inclosed in a swell box which opens on all four sides. The

solo organ contains the orchestral stops, some or all of which may be inclosed in a swell box. The *echo organ* is made up of stops of small scale and of delicately soft tone. They are sometimes included in the swell box of the swell organ, even though they have a separate manual. Where this is done, however, it is usual to inclose them in a box which must be not less than three inches in thickness. The *pedal organ*, as its name implies, belongs to the pedalboard and consists of ranks of pipes which practically are a continuation of the manuals. They are of more powerful tone, however, and are so designed as to afford a suitable bass or contrast to any stop upon the manuals.

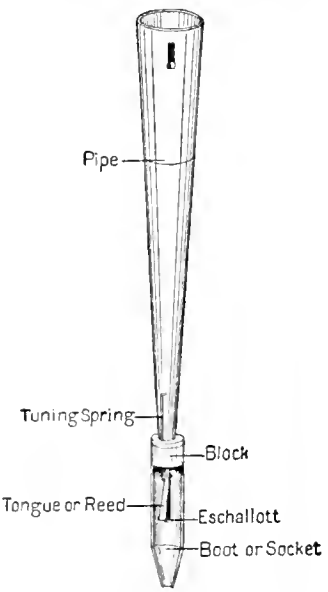


TYPICAL ORGAN PIPES.

1, open cylindrical metal flue pipe; 2, conical metal flue pipe; 3, conical metal flue pipe with bell; 4, inverted metal flue pipe; 5, stopped cylindrical metal flue pipe; 6, half stopped cylindrical metal flue pipe; 7, rectangular wood pipe; 8, triangular wood pipe; 9, pyramidal wood pipe; 10, cylindrical wood pipe; 11, inverted pyramidal wood pipe; 12, stopped rectangular wood pipe; 13, one-half rectangular reed metal pipe; 14, inverted conical reed metal pipe; 15, bell-topped inverted reed metal pipe; 16, cylindrical reed metal pipe; 17, cylindrical reed metal pipe with bell top; 18, conical reed metal pipe; 19, cylindrical half-stop reed metal pipe.

THE STOPS. Each stop includes a number of pipes which follow each other chromatically and extend over the entire keyboard or some portion of it. Each set of pipes consists of tubes producing the same quality of tone throughout; thus the German term *Stimme* (voice) for stop is singularly appropriate. Stops are classified as (a) complete stops, (b) incomplete stops, (c) short stops, (d) divided stops, (e) compound stops. Complete stops extend the entire length of the keyboard; incomplete stops do not do so. Short stops are those which cannot be completed by any other stop. Divided stops are those which divide the manual compass between them. Compound stops have two or more pipes to a note. (See MIXTURE.) The tone qualities of the pipes of an organ may be classified as follows: The *organ tone*, which is best represented by the English 16-foot and 8-foot open diapason octave works; the German 16-foot, 8-foot, and 4-foot principle; and the French 16-foot, 8-foot montre, and 4-foot prestant; the *flute* tone by the 16-foot bourdon, 8-foot stopped diapason, Gedeckt, Melodia, Clarabella, and the 8-foot and 4-foot flutes; the string tone by the 16-foot pedal violone, contra gamba, 8-foot violin, 'cello, gamba, keraulophon, salicional, viol d'amour; the reed tone by the trumpet, oboe, bassoon, clarinet, vox humana, trombone, etc. The structure of organ pipes consists of two general classes, viz. flue and reed pipes. The former derive their name from the method by which their tone is produced, i.e. the passing of air from the foot of the pipe through a *flue*, or narrow opening, across the mouth of the pipe. Such pipes are made of metal and wood. If of the former, they are cylindrical in form, and when of the latter material, they are either rectangular, triangular, or cylindrical. The pitch and quality of the tone depends on the length and general character of the flue pipe. Metal flue pipes may be either open cylindrical, conical, conical with bell at the top, conical inverted, stopped cylindrical, or half-stopped cylindrical. Wood pipes are either open four-sided, or rectangular; three-sided or triangular; pyramidal; inverted pyramidal; turned cylindrical; stopped rectangular; and half-stopped rectangular.

Reed pipes are of two kinds—the striking or impinging reed, in which the vibrator strikes against the reed or metal tube inserted in the block of metal which fits into the boot of the



REED PIPE.

pipe, and the free reed which in vibrating passes in and out of the opening freely and without touching or striking. This latter species, however, is seldom used. With the impinging reed the vibrating portion of the tongue may be lengthened or shortened, and made to vibrate

slower or faster by raising or lowering the tuning spring, and thus bringing it to the desired pitch. In the case of the free reed, the tongue vibrates in the opening on the face of the eschallott. Sometimes the tuning is regulated by thumb-knots on a threaded wire. Reed pipes are either of metal or wood; in the former case their shape is either inverted conical, the same surmounted with a bell, cylindrical, the same surmounted with a bell, conical, or cylindrical half stopped. With the lowest toned reeds the pipes are usually of wood, four-sided, and in some organs are thirty-two feet in length. Free reed pipes have their bodies usually made of wood. The peculiar quality of the reed tone is largely caused by the presence of harmonics, and is due chiefly to the curve of the tongue, and the scaling and length of the tube. As in the case of flues, reed pipes are occasionally made of double or half length. It was stated earlier in this article that the reeds were peculiarly French and that the Germans were strongly inclined to the flues. Locher speaks of this as nationally characteristic, and gives the two following examples: The Münster organ in Ulm (Walcker), as compared to the organ of the Trocadéro Palace, Paris (Cavaillé-Coll); and the organ of Saint Johanniskirche, Stuttgart (Weigle), as compared to the Münster organ, Geneva (Merklin). An ancient family name for such reed stops as the Geigenregal and the Jung-Fernregal is 'Regals,' which is still sometimes used.

The parts of the organ naturally fall into three divisions: the pipework, the mechanism for blowing (bellows, channels, wind chest, etc.), and the mechanism by which the wind is utilized. The pipes are arranged according to the stops to which they answer. Each pipe gives but one sound, so that the number of pipes must equal the number of sounds required, and if there is but one stop on the organ, there would have to be as many pipes as there are keys on the clavier. The pipes of each register are so placed that they can all at the same time be connected or shut off together by the action of the stop. The pulling out of a stop admits the wind to the chest, so that it is only necessary to press the key, which in its turn opens a small valve, to voice the pipe belonging to that key. The various manuals are connected together by couplers, manual and pedal. The frame ordinarily unites the manuals with the great organ, but in all large organs and the most recent small organs the manuals may be coupled among themselves; besides these there are the octave couplers, which unite every key with that of the upper or under octave, or both, in which latter case it is generally called the double-octave coupler. This coupler produces an exceedingly full tone. When we speak of *pneumatic action* we mean the mechanism which is used to operate the pallets and stops and their moving mechanism, the motive power being compressed air or atmospheric pressure rushing in to fill the vacuum. In every case the motor is a bellows, i.e. a device for generating wind, and of an extensible or collapsible design. Motors may be either near the keyboard transmitting their power in the desired direction by means of a long tracker, or they may be situated near the part upon which they act, in which case they are governed by other small motors situated near the keys and connected with the large motors by small tubes of indefinite length. In the first instance the transmission of power is by trackers, but in the latter instance it is by what is called tubular pneumatics. In the tubular pneumatic system the position of the motors inside of the wind chest enables the pressure of the wind, when the key is at rest, to have access also to the interior of the motor, so that the top is balanced by the pressure of the wind within and without. The ordinary pneumatic lever action may be said to work on the principle of the inflation of a feeder or motor. In this action the pressure of wind, or the size of the motor, must be so arranged as to be of sufficient power to draw the action attached to that portion of the motor which is free to move when the inflation takes place. While this action is exceedingly useful for large instruments, in which the complicated mechanism makes the touch too heavy for comfortable playing, it nevertheless lacks the exact precision of attack, and is fatal to correct phrasing and touch, in that there is no sharp edge to the cessation of tone. Tubular pneumatics, on the other hand, have been found to give a very prompt tone in pedal work, owing to the fact that the pallets instead of being hinged may open and close in parallel motion. If well made, this action will not easily get out of order, besides which it appeals to the player in that it lends itself easily to octave work. Its expense, however, is a serious item, owing to the weight and cost of the tubing and necessary apparatus. Electro-pneumatic actions, which are, as their name implies, a combination of electrics and pneumatics, have thus far satisfied all requirements except perhaps that of absolute reliability, although the advocates of the principle assert that that fault has been overcome. In this action a tiny disk valve is opened by electricity and admits the heavy pressure wind to the pneumatic movement near the pallet. The console or keyboard, through the various mechanical and electrical actions, may be placed in any position convenient to the player, quite independent of the location of the instrument. Numerous mechanical aids to registration are also important features of the modern organ.

Bellows of the simplest form are constructed after the manner of the smith's bellows, i.e. pump work. A distinction is made between horizontal and diagonal bellows. Of whatever shape or form they are but one thing is necessary, that they be ample for the full organ. Automatic organ-blowing engines or apparatus are now common, the manufacture of which is a trade by itself. The rule has been laid down that a water pressure of at least thirty-five pounds to the square inch is necessary for blowing by water. In this method two pairs of bellows are required, one pair (which is for the exclusive operation of the engine) having square rising feeders and an ordinary waste valve, and the other pair being specially provided with feeders so that in case of failure of the water or engine the bellows may be blown by hand. Electric and gas engines are not quite so economical, and suffer in comparison with water power from the fact that the electric engine is subject to disarrangement, and the gas engine is somewhat noisy by reason of the explosions.

Soundboards and wind chests are required to be of sufficient length and width to give the pipes plenty of speaking room. The wind chest is an air-tight box or chamber having channels above the valves or pallets, one for each note. In connection with the wind chest or soundboard is the slider. When the performer draws a stop the holes in the slide correspond to the holes in the table and upper board, and thus enable the wind to pass from the channels to the pipes. When the stop is returned, the slide is moved so that the holes do not correspond, and the plain surface closes the channels to the pipes. Valve pallets are about an inch in thickness and from eleven to sixteen inches in length. All the spaces between the lower edges of the partitions of the soundboard except those which the valves cover are packed with filling, and each valve is maintained in its place by a steel spring. When the valve is opened to admit the wind to a pipe it is pulled down about half an inch at one end, while the other end is held in place by a pin. The valves in the wind chests are worked by a mechanism which is connected with the keys.

The *key action* deals with the entire process of causing a pipe to speak, the simplest method of which perhaps is the lever or fan frame movement when the wind chest is built on semitonal principles; upright rods (*stickers*) are placed upon the inside ends of the keys, and the tops of these are inserted in one end of the levers, which are arranged perpendicularly over each respective key, the other ends converging under the pull-down wires of the wind chest. Should these wires be some distance from the keys, tracker action is used. Trackers are thin strips of wood capable of sustaining weight longitudinally; should the trackers be very long, guides are provided for their support. Thus when the key is depressed it causes an almost instantaneous action whereby the wind is permitted to reach the pipe and cause it to speak. The compass on an organ manual is usually from CC to G or A, although it is better extended to C, as is sometimes done, thus completing the five octaves. This latter is especially desirable where the pedal organ ranges from CCC to F (30 notes). The names of the more important stops will be found discussed under their own titles. See also HARMONIUM; MELODEON; VOICING; TEMPERAMENT; TREMULANT; TUNING.

BIBLIOGRAPHY. Hinton, *Organ Construction* (London, 1900); Lahee, *The Organ and Its Masters* (Boston, 1903); Matthews, *A Handbook of the Organ* (London, 1897); Frenzel, *Die Orgel und ihre Meister* (Dresden, 1884); Ziemmer, *Die Orgel* (Quedlinburg, 1896); Dixon, *Practical Organ Building* (London, 1881); Stainer, *The Organ* (ib., 1877); Hill, *The Organ Cases and Organs of the Middle Ages and Renaissance* (ib., 1891); Hopkins, "The English Mediæval Church Organ," in *The Archæological Journal*, vol. xiv. (ib., 1888); Elliston, *Organs and Tuning* (ib., 1894); Hopkins, *The Organ, Its History and Construction* (3d ed., ib., 1877); Sutton, *Church Organs, Their Position and Construction* (ib., 1872); Warman, *The Organ: Its Compass, Tablature, and Short and Incomplete Octaves* (ib., 1884); Seidel, *Die Orgel und ihr Bau* (4th ed., Leipzig, 1887; Eng. trans., London, 1885); Peschard, *Les premières applications de l'électricité aux grandes orgues* (Paris, 1890); and for a bibliography of the organ, consult *Notes and Queries* (London, 1890).

ORGAN-BIRD. The name of two different song-birds, whose clear warbling notes suggest the tones of an organ. One is a wren (*Cyphorhinus cantans*) of the Amazon Valley; the other a piping crow (q.v.) of Tasmania (*Gymnorhina hyperleuca.*)

ORGANIC BASES. See ALKALOIDS; AMINES; and PTOMAINES.

ORGANIC CHEMISTRY. The chemistry of the compounds of carbon. See CARBON COMPOUNDS.

ORGANIC SENSATIONS. "Sensations adequately stimulated by changes in the condition of the bodily organs—muscles, joints, etc. In every case, the adequate stimulus consists of a change in the condition of the particular organ, and the organ itself is the peripheral seat of origin of the nervous excitation which is thus set up." (Külpe.) The only difference, then, between the 'sensations of special sense' and the organic sensations is that the organs of the former are stimulated from without, by some movement-process in the external world, while the latter are aroused by a bodily process within the organ itself. The distinction is convenient for purposes of classification, but has no psychological importance, since the sensations of the 'five senses' also presuppose a change in their organ; the 'stimulus' makes its impression on the brain by way of a bodily process in eye, ear, etc. Indeed, that there is no difference of kind between the two classes of sensations is shown by the attitude of popular psychology, which sometimes speaks of the 'five senses,' as if there were no more, but sometimes also adds a sixth sense, the 'muscle sense' (q.v.), to the five external senses.

The organic sensations, so far as they are known, fall into six principal groups. (1) We have, first, the group of 'kinæsthetic' sensations, the sensations which are excited by movements and similar stimuli (weight, resistance, position, etc.), and which furnish us with our bodily (non-visual) knowledge of the movement and position of the members. The specific quality of *muscular* sensation is a dull, dead pressure; that of *tendinous* sensation is strain; and that of *articular* sensation, the sensation set up by the rubbing or jamming of the joint surfaces, is a sharp pressure, which appears to be identical with the pressure obtained from the pressure-spots of the cutis. (See CUTANEOUS SENSATIONS.) These qualities have been identified, in the complex experiences within which they normally occur, partly by the laboratory method of elimination, and partly by the investigation of pathological cases. We can, e.g. by keeping the member unmoved and etherizing the skin, stimulate the muscle alone; or again, by etherizing the skin and muscle, stimulate the joint alone; or again, by passing a strong induction current through the joint, practically rule out the articular sensations. Since our sensitivity for lifted weights remains but little impaired when the sensations from skin and muscle are thus ruled out, we refer this function to the tendinous strain sensation, which remains clear in consciousness. Since a similar elimination does not affect our judgments of position and movement, while elimination of the joint sensations renders them

extremely uncertain, we refer these functions, in the same way, to the articular surfaces. On the pathological side, we find normal judgment of the position of the limbs compatible with anæsthesia of the external skin and muscles; whereas if the whole limb is insensitive there is no knowledge of its movement or place. Moreover, patients of the first class give the most accurate judgments of position and movement if the articular surfaces are closely pressed together.

(2) Of great importance in the economy of the organism are the alimentary organic sensations. These are three in number: the sensation of *hunger*, from the stomach; that of *thirst*, from the pharynx; and that of *nausea*, from the œsophagus. The adequate stimulus to hunger appears to consist in the drying and folding of the gastric mucous membrane, the lining of the 'wall' of the stomach, though hunger may be relieved by the injection of food into the large intestine. Thirst is set up by the drying of the pharyngeal mucous membrane, and may be relieved (though not permanently) by painting the back of the throat with a weak solution, e.g. of citric acid. The stimulus to nausea is, perhaps, the antiperistaltic movement of the œsophagus, which, in extreme form, passes over into the vomiting reflex. The experience of nausea usually includes sensations of taste, smell, and dizziness (see 6 below), so that the isolation of its specific quality is extremely difficult.

(3) There seems to be no doubt that *circulatory* sensations, stimulated by changed conditions of blood movement and blood supply, appear in certain organic complexes, though we cannot identify them with any degree of accuracy, or do more than guess at the conditions of their origin. Itching, tingling, formication, pins and needles, creeping, tickling, feverishness, etc., are the complexes in question. The sensation of cutaneous warmth that follows upon the pain of a smart blow upon the palm of the hand is possibly referable to circulatory sensations, though it may also be a true temperature sensation.

(4) Much the same thing must be said of the *respiratory* sensations. There seems to be a specific breathing quality in such experiences as panting, stuffiness, a bracing air, 'second wind,' breathlessness, etc.; and the lungs contain sensory nerve-endings. But of the number and nature of the respiratory qualities we are still ignorant.

(5) No systematic study has so far been made of *sexual* sensation. The sensation of lust is presumably the same in both sexes. We know, however, nothing in detail of its terminal organs, and little of its distribution over the organs of sex.

(6) The sensation of *dizziness* or giddiness is mediated by the semicircular canals of the internal ear, which are supplied by the vestibular branch of the auditory nerve. (See EAR.) The semicircular canals and vestibule constitute an organ which assists us, reflexly, to maintain our equilibrium and to orientate ourselves in space. Under certain conditions (for which see STATIC SENSE), in which there is disturbance or derangement of our space perceptions and relations, they serve as a sense-organ: and the sensation of dizziness, unpleasant as it is, plays a useful part as a warning of spatial disorientation.

The above list gives the full tale of organic qualities, so far as known, with the single exception of pain (q.v.). It is characteristic of the group that the sensations do not form closed systems of varied content, as do those of the most highly developed senses, sight and hearing, but stand out singly, as do the qualities of cutaneous and gustatory sensation in the external or 'special sense' group. Whether further analysis will bring with it a greater differentiation, so that there will prove to be a number of hunger qualities, a number of qualities of 'oppressed breathing,' etc., we cannot say; but such a result is improbable. Neither is it probable that qualities once separate have now fused, or that certain qualities have lapsed altogether. The organic sensations are processes of very ancient origin, which (like the sensations of pressure, temperature, and taste) have persisted with relatively little change as the organism has grown in complexity. They play an important part in systematic psychology. They form the constant background of the psychological self, and thus contribute largely toward the 'unity' or centralization of consciousness; they furnish the commonest sense-basis of the feelings; and they functionate in a surprisingly definite and authoritative way in recognition and reproduction (qq.v.).

It may be added that 'efferent' or 'innervation' sensations, in all probability, do not exist. The 'effort' that we put forth in lifting a heavy object is derived from memories, images, of previous liftings, and is not a new sensation accompanying the innervation of the arm muscles.

BIBLIOGRAPHY. Külpe, *Outlines of Psychology*, trans. (London, 1895); Goldscheider, *Gesammelte Abhandlungen*, vol. ii. (Leipzig, 1898); Wundt, *Physiologische Psychologie*, vol. i. (Leipzig, 1893); Sanford, *Course in Experimental Psychology* (Boston, 1898); Kröner, *Das körperliche Gefühl* (Breslau, 1887); Beaunis, *Les sensations internes* (Paris, 1889); Foster, *Text Book of Physiology*, vol. iv. (London, 1891); Titchener, *Outline of Psychology* (New York, 1899); id., *Experimental Psychology* (ib., 1901).

See COMMON SENSATION; MUSCLE SENSE.

ORGANISM. A living being, plant or animal, of which the essential constituent is protoplasm (q.v.; also ORGAN). The world of organisms or the 'organic world' is opposed to the mineral world—to lifeless things. There may be a degree of organization in a mineral, but it is a non-living, inorganic substance. An organism is a living being more or less differentiated into parts or organs, each with its peculiar formation.

ORGAN MOUNTAINS. The highest portion of the Brazilian Coast Range or Serra do Mar (q.v.).

ORGANOG'RAPHY (from Gk. ὄργανον, *organon*, organ + γράφειν, *graphein*, writing, from γράφω, *graphō*, to write). That division of biology which treats of the origin and cause of form. See LEAF; STEM; ROOT.

ORGANO-METALLIC COMPOUNDS. An interesting group of chemical compounds, in which organic radicles, such as methyl, CH_3, ethyl, C_2H_5, etc., are united to metals. Zinc-ethyl, which is a good example of the class, is obtained by digesting granulated zinc with ethyl iodide, C_2H_5I, at a temperature of about 600° F., for several hours. It is thus obtained in the form of a colorless, transparent, mobile liquid which

strongly refracts light, has a powerful, rather disagreeable odor, and is considerably heavier than water. Its boiling-point is 118° C. (244.4° F.). Chemically, it is very unstable, and when exposed to the air it takes fire spontaneously; it must, therefore, be handled with care and kept in vessels filled with carbonic acid gas. The properties of the other organo-metallic compounds of zinc, such as zinc-methyl, $Zn(CH_3)_2$, zinc-propyl, $Zn(C_3H_7)_2$, etc., are similar to those of zinc-ethyl, and so are the methods of preparing them. Among the corresponding compounds of lead must be mentioned lead tetra-ethyl, $Pb(C_2H_5)_4$, and lead tri-ethyl, which probably corresponds to the molecular formula $Pb_2(C_2H_5)_6$. The former of these may be obtained by the action of lead chloride on zinc-ethyl, the latter by the action of an alloy of 1 part of sodium and 3 parts of lead on ethyl iodide. It will be seen that while in its most stable inorganic compounds lead is divalent, in its organic compounds it is quadrivalent; in the case of its tetra-ethyl compound this is evident; but the tri-ethyl, too, probably has the constitution $(C_2H_5)_3Pb—Pb(C_2H_5)_3$, and hence contains lead in the quadrivalent state. Other metals capable of forming organic compounds include mercury, magnesium, cadmium, aluminum, thallium, and probably also sodium and potassium. In the case of metals whose atoms possess more than unit valency, compounds have been obtained in whose molecules a metallic atom is combined at the same time with organic radicles and with halogen atoms (like chlorine or iodine) or hydroxyl groups (OH). Thus the compound known as mercury-ethyl chloride has the formula C_2H_5HgCl, mercury-methyl iodide has the formula CH_3HgI, lead tri-methyl hydroxide has the formula $Pb(CH_3)_3OH$, etc. The hydroxyl-compounds, like that just mentioned, are strongly basic—about as strong, in fact, as caustic soda or caustic potash.

The organo-metallic compounds are useful in the synthetic preparation of a number of organic substances. They were discovered by Frankland, and it was while studying these compounds that Frankland first conceived the idea of valency, which has since formed the most important part of the atomic theory.

OR'GANON (Lat., from Gk. *ὄργανον*, instrument). The title under which the later Peripatetics included Aristotle's writings on the general subject of logic, as concerned with reasoning, the chief instrument of investigation.

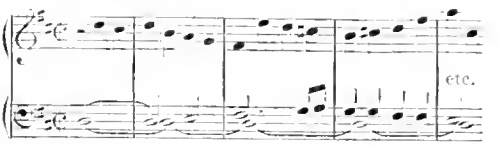
OR'GANOTHER'APY (from Gk. *ὄργανον*, *organon*, organ + *θεραπεία*, *therapeia*, attendance, medical treatment, from *θεραπεύειν*, *therapeuein*, to attend, treat). The use of animal glands, or extracts made from them, as medicines. In his Hunterian lecture for 1902 in London, Davies claims that the use of animal remedial preparations dates from B.C. 1500. An enormous number of preparations of extracts from the human body and from animals is mentioned by William Salmon, in his work published in 1677. Modern organotherapy, however, dates from the lectures of Brown-Séquard in 1869. He advanced the hypothesis, "all glands of the body, whether they are excretory canals or not, give to the blood useful principles, the absence of which is felt when the glands are extirpated or destroyed by disease." Recent experiments confirm this view, and substantiate the claim of Brown-Séquard (q.v.). Besides spermatozoa, the testicles secrete a fluid which when absorbed into the system acts as a nerve stimulant and tonic. Brown-Séquard's 'elixir' is an extract of lambs' testicles. When administered hypodermically it produces an increase of hæmoglobin, an improvement in the cardiac force, exaltation of the vascular tone, and greater mental activity. Extravagant hopes were indulged by Brown-Séquard, and by some of his disciples, for testicular extract; and as the claims made were little short of ridiculous, his reputation suffered somewhat during the last years of his life. The extract has been employed, however, with varying results in hysteria, neurasthenia, locomotor ataxia, scurvy, marasmus, tuberculosis, epilepsy, and insanity. The active principle of this extract, *spermin*, is a leucomaine, and hence promotes oxidation in the body, probably relieving the nervous system to a certain extent of the results of auto-intoxication. Testicular extracts are variously termed spermin, testaden, didymin, testine, testidin, testin, orchidin, etc. Like all the animal medicinal products, testicular extract is prepared in powder and in liquid form. Ovarian extract is similar, though less powerful. It has been used in chlorosis, amenorrhœa following atrophy of the genitals, or after partial or entire extirpation of the ovaries, or during the menopause. It must be used with great caution. It is variously called ovadin, ovaraden, oöphorin, and ovulin. Thyroid extract is the most useful of all these preparations and is of distinct and definite value and causes no uncertain effects. It is prepared from the thyroid glands of sheep. It has been very successfully employed in psoriasis, eczema, lupus, sporadic cretinism, goitre, myxœdema, uterine fibroma, and obesity. It is named thyreoidin, thyroproteid, iodothyrin, thyraden, etc.

Thymus extract, prepared from the thymus glands of young sheep or pigs, has been successfully used in exophthalmic goitre and most of the conditions that are benefited by thyroid extract, except obesity. Suprarenal extract is prepared from the suprarenal (or adrenal) glands. It has been moderately successful in Addison's disease, diabetes insipidus, and neurasthenia. In certain other conditions brilliant results have followed its use. It is a valuable vaso-constrictor and cardiac tonic, and it has some value in certain heart diseases. When applied locally it is a powerful astringent, and its most important use is in checking hemorrhage, accomplishing this result whether administered internally or applied locally. It is called supradin or suprarenaden, and a fluid extract of the suprarenals is termed ojos-suprarenalin. A specially active preparation of the capsules made by Dr. Fraenkel is called sphygmogenia. The active principle of the capsules has been extracted by Takamine, by whom it has been named adrenalin. This preparation appears to be the most reliable and of most even strength of the preparations of the glands on the market. An extract prepared from the pituitary of the sheep has been used in a few instances by Marinesco, who claims success in the treatment of acromegaly (q.v.) with this agent. Preparations of the prostate gland of the bull have been used in cases of hypertrophy of the prostate in man. In dry form this extract is termed prostata. It is little known.

The term organotherapy has been expanded to

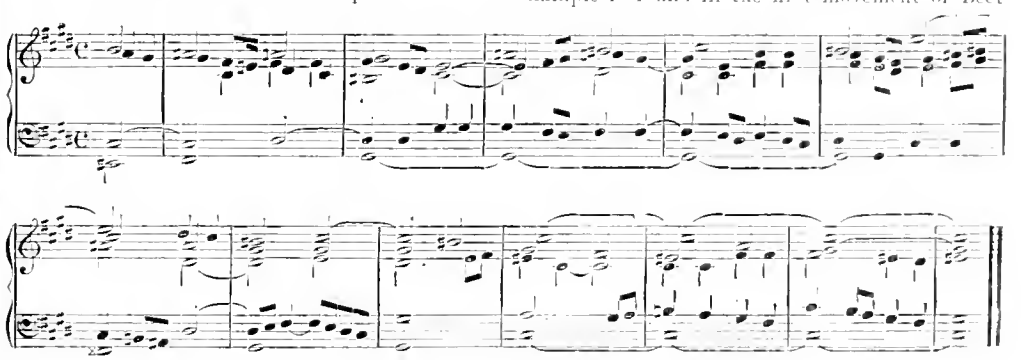
include the use of extracts prepared from various organs of the body, as well as the glands mentioned, in acquiescence with the extension by D'Arsonval of Brown-Séquard's hypothesis, as stated. While this use of the term is as deplorable as the ideas of D'Arsonval, for convenience sake it must be adopted. We find, therefore, extracts of the brain (cerebrin) recommended in neurasthenia, chorea, various psychoses, and conditions in which agoraphobia is present (see INSANITY); extracts of the kidney (renes, opo-renin, succus renalis) recommended in nephritis; spleen extract (linadin, nuclein, eurythol, neucleohiston) recommended in the treatment of anæmia, myxœdema, rickets, enlarged spleen, typhoid fever, goitre, leucocythæmia, and Hodgkin's disease; as well as musculine, extracted from the muscle of the ox; mammæ, extracted from the udder of the cow; and pulmonin, extracted from the lungs of calves. Most of these extracts from organs are apparently inert, some are useless. Nuclein alone seems really valuable. To the list should be added bone-marrow extract, which is a valuable preparation of the red marrow of bones, and chiefly made from the ribs and femur heads of calves. It is very successful in the treatment of anæmia and chlorosis.

ORGAN-POINT. A long sustained tone in one voice while the other voices proceed in independent harmonies. The name is derived from *organicus punctus*, which in the twelfth century, the time of the *organum* (q.v.), was a long sustained note of indefinite duration generally held by the tenor (whence the name of the voice), over which the other voices executed a florid counterpoint. Organ-point is also called *pedal-point*, because the pedal of the organ is best suited to sustain those long notes. But for etymological reasons it is best to use the name *organ-point*. The organ-point may occur in any voice. It seldom occurs in the middle voices, more frequently in the soprano, but generally in the bass. The modern tendency is to recognize the organ-point only in the bass; hence the sustaining of a long note in the soprano is called *holding note*. The laws governing the introduction of an organ-point in the bass are: (1) That the sustained note shall be either the tonic or dominant; (2) that it shall begin and end on a strong beat and form an essential part of the harmony of the beginning and closing chords. During the organ-point the other voices may proceed through any chords. Of course modulation of any length is excluded. An organ-point is generally introduced just before the end of a composition. Bach and Handel end many of their fugues on an organ-point. The following from the Scherzo of Beethoven's Ninth Symphony is an organ-point on the tonic:

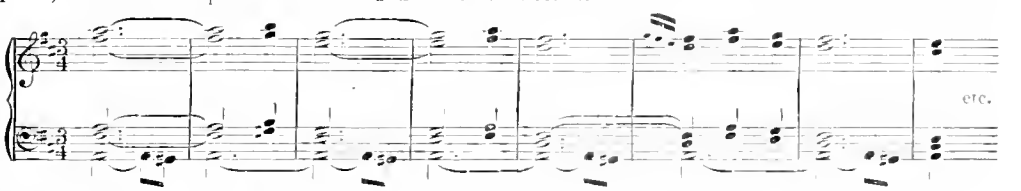


In Fugue No. 4 from part I. of the *Well-tempered Clavichord* Bach introduces an organ-point on the dominant before the close which he constructs over an organ-point on the tonic, at the same time giving a holding note to the soprano.

A double organ-point on both tonic and dominant is often found in modern compositions, especially in those of a pastoral character. A fine example is found in the first movement of Beethoven's Pastoral Symphony (beginning at bar 29). There is also a *figured organ-point*, when the sustained note is varied, sometimes with a single note, sometimes with a group of notes. The following example from Beethoven's Seventh Symphony (Trio of Scherzo) illustrates this:



The longest organ-point that has ever been written consists of 138 bars and occurs at the beginning of the prelude to Wagner's *Rheingold*. See HARMONY.



ORGA'NUM (Lat., from Gk. ὄργανον, instrument, organ). In music, a term used to denote the primitive attempts at polyphony by leading the voices in open fifths. This succession of empty fifths is but a natural and logical step in the evolution of polyphony (q.v.). The first step (and this was already known to the

ancient Greeks) was the doubling of voices in the octave. Music remained at this point until in the latter half of the ninth century a second part was added a fifth below, and soon after a fourth below. Thus it is seen that only the *perfect* intervals were first used. Since then the evolution of music has been comparatively rapid. See HARMONY.

ORGANZINE (from It. *organzino*, organzine). A silk thread used chiefly for warp, in silk-weaving. It is formed by the union of two or more single threads, which are twisted separately in the same direction and are then doubled and retwisted in the opposite direction. See SILK.

ORGEYEV, ôr-gyā'yĕf. A district town in the Government of Bessarabia, Russia, situated 28 miles north of Kishinev. There are some ruins of the old Dacian fortress, the site of which is now occupied by the town. Agriculture and gardening are the chief occupations. Population, in 1897, 13,356.

ORGETORIX, ôr-jĕt'ô-rĭks (?-c.62 B.C.). A rich and powerful chief of the Helvetii, whose intrigues are recorded in Cæsar's *Commentaries* (book i.). He wished to possess himself of the chief power in his State, and therefore persuaded the Helvetii to emigrate to Gaul (B.C. 61). In consequence he was summoned to trial, but died, probably by his own hand, before the case could be heard. Consult Cæsar, *De Bello Gallico* (i. 2, 26); and Dion Cassius, xxviii. 31.

ORGIES, ôr'jĭz (Lat. *orgia*, from Gk. ὄργια, secret rites; probably connected with ἔργον, *ergon*, work, and ultimately with Eng. *work*). The name given in ancient Greece to the ceremonies connected with the worship of various divinities, particularly the wine god Dionysus or Bacchus. See MYSTERIES.

ORGUINETTE, ôr'gĭ-nĕt' (pseudo-French spelling of **organette*, diminutive of *organ*). A mechanical musical instrument, with sets of reeds, and an exhaust bellows, operated by a crank. A perforated strip of paper passes over the ends of the reeds, and the air (forced by the bellows through the perforations and into the reeds) produces certain musical tones. This instrument, in its present form, was developed from the inventions of Seytre, of France (1842), who is acknowledged to be the pioneer in the preparation of music on slotted paper, and Alexander Bain, of Scotland (1847), who obtained a patent for his own application of a sheet of slotted paper, or any flexible material, which acted as a moving valve. In 1848 Charles Dawson, of England, further experimented upon a music sheet similar to those of Seytre and Bain, but with a different arrangement of the air-chest and pipes. A further improvement was made by Pape, of France, in 1851, and also by Fourneaux (1863). In 1867 George Vanduzen used a slotted belt, but it was not until 1877, after the Centennial Exhibition, which seems to have given it an impetus, that Mason J. Mathews adjusted all difficulties; and E. P. Needham, who had also patented an instrument of this kind, and Newman R. Marsh commenced to manufacture orguinettes.

ORIAN'A. (1) The daughter of Lisuarte of England, beloved by Amadis of Gaul, and celebrated for her beauty and constancy. Queen Elizabeth is so called in the madrigals entitled *The Triumphs of Oriana*, collected by Thomas Morley (1603), and the name was given by Ben Jonson to Queen Anne, wife of James I. (2) The heroine of Fletcher's *Wild-Goose Chase*, Farquhar's *The Inconstant*, and Tennyson's ballad *Oriana*.

ORIANI, ô'rē-ä'nē, BARNABA (1752-1832). An Italian astronomer, born at Garegnano, near Milan, the son of poor peasants. Astronomy he learned from Lagrange; and in 1802 he was appointed director assistant in the Brera observatory in Milan. After the discovery of Uranus, Oriani showed that it was not a comet, as Herschel had supposed, but a planet. He edited *Effemeridi Astronomiche* (1778-1830), wrote much on astronomy, and made some important contributions to spherical trigonometry. His correspondence with Giuseppe Piazzi was edited by Cacciatore and Schiaparelli (Milan, 1875).

ORIBA'SIUS (Lat., from Ὀριβάσιος, *Oribasios*), OF PERGAMUM (c.325-c.400). The physician and adviser of the Emperor Julian the Apostate. After the death of Julian, Oribasius was banished by Valentinian and Valens, but was recalled about 370. Of his principal work, a medical encyclopædia, Συναγωγαὶ ἰατρικαί, in 70 books, less than half is preserved. It was written at the request of Julian, and though chiefly a compilation of earlier works, contains some important original matter; valuable explanations of many passages in Galen's works; and extracts from works not extant. In addition to this work, there are preserved Oribasius's abridgment (Σύνοψις) of the work, in nine books, and the Εἰσόρισια, also a medical treatise, in four books. The best edition is by Daremberg (Paris, 6 vols., 1851-76). Oribasius was the first to describe the salivary glands.

ORIBE, ô-rē'bĕ, MANUEL (c.1802-57). A South American general, President of Uruguay. He was born in Montevideo; entered the patriot army of Rio de la Plata when he was only a boy; and rose to high rank. In 1825 he was prominent in the rising against Brazil. He became Minister of War under Rivera in 1833 and was elected President two years afterwards. Rivera, as leader of the Colorado party, rebelled against Oribe in 1837, and succeeded in deposing him just before the end of his term. Oribe fled to Buenos Ayres, and with the help of Rosas began (1842) the Nine Years' War, an attempt to subjugate Uruguay to foreign rule. The interposition of France and Brazil forced him out of the country. Again in 1855 he led a revolt against Flores and would have made himself President but for the intervention of the Powers.

O'RIBI, or **OU'REBI** (South African name). A small antelope (*Neotragus scoparius*) which is closely allied to the grysbok, and inhabits Southeastern Africa, where it has become rare.

ORIEL COLLEGE. A college at Oxford, England. It was founded by Adam de Brome, Clerk in Chancery and Almoner of Edward II., in 1324, but almost immediately thereafter came into the hands of the King, and was refounded as the College of Saint Mary in Oxford. This in turn gave way to the present name, apparently on account of the society's moving into a house given it by Edward III., about 1328, called La Oriole. Oriel College consisted originally of a

provost and 10 fellows. Owing to the fact that the founder's will did not provide for close scholarships, or those confined to a family or district, as was the custom of the time, the open fellowships of Oriel, obtained as they were by competition, attracted many of the best men in the university in later years, and built up a strong and influential group of scholars who gave the college an enviable position in the academic world. After the changes of 1855 the college consisted of a provost, 12 fellows, a number of honorary fellows, college officers, and lecturers, about 15 scholars, 2 Bible clerks, and some 100 or more undergraduates in all. The buildings are picturesque, and the Hall is a very fine room. The college is particularly associated with that group of men who were most actively engaged in the Tractarian movement, Keble, Whately, Newman, Thomas, Arnold, and Pusey. Of other names may be mentioned William Langland (author of *Piers Plowman*), Barclay (author of *The Ship of Fools*), Sir Walter Raleigh, William Prynne, Bishops Butler, Wilberforce, and Hampden, White of Selborne, Dean Church, Thomas Hughes, Matthew Arnold, Clough, and Cecil Rhodes. The college presents to 15 livings. See OXFORD UNIVERSITY; OXFORD MOVEMENT.

ORIEL WINDOW (OF. *oriel*, from ML. *oriolum*, small room, *porch*, perhaps from Lat. *aureolus*, golden, from *aureus*, golden, from *aurum*, gold). A projecting window with three or more sides and commonly divided into bays by mullions. It is usually distinguished from a bay window, which projects from the base line of a building, by being applied to windows projecting from an upper story and connected with the flat wall below by some architectural feature such as a corbel or bracket. It is characteristic of late Gothic civil and domestic buildings, especially in France and England, and was not much used in the earlier Middle Ages.

ORIENTAL REGION (Lat *orientalis*, relating to the east, from *oriens*, pres. part. of *oriri*, to rise; connected with Gk. *ὄρνυναι*, *ornynai*, Skt. *ar*, to rise). A primary division in zoögeography, comprising Southeastern Asia and the adjacent islands as far as Wallace's line. (See DISTRIBUTION OF ANIMALS.) This "small, compact, but rich and varied" region, according to Wallace, consists of all India and China, south of the Himalayan highlands; all the Malay Peninsula and islands as far east as Java and Bali, Borneo and the Philippines; and Formosa. It is divided into four subregions: (1) Ceylonese, Southern India and Ceylon; (2) Indian, from about Madras to the foot of the Himalayas; (3) Indo-Chinese, Burma and Southern China; (4) Malayan, the Peninsula of Malacca and the Malay and Philippine Islands. This region possesses about a dozen peculiar families of vertebrates, and more than 200 exclusive genera among mammals and birds alone. Striking examples among these are orang-utans, gibbons, the proboscis monkey (the region is very rich in quadrumana), the tarsier and certain other lemurs; many bats and insectivores; most of the civets and many cats; the curious panda; two genera of bears; wild cattle, an elephant, and two or more species of rhinoceros. Among the birds, a great variety of small birds do not occur elsewhere; parrots and pigeons abound, and gallinaceous birds are more numerous and varied than anywhere else, the pheasants, jungle-fowls, and other groups being peculiar. In respect to insects, the region is hardly less rich than the Neotropical. The affinities between the Oriental and Ethiopian fauna have impressed naturalists strongly, and some have thought that India ought to be included in the latter region; but the weight of opinion seems to favor retaining the boundaries of the Oriental Region as they were made by Wallace. Consult Wallace, *Tropical Nature* (London, 1878).

ORIENTAL SEMINARIES. The name applied to certain European institutions established for the purpose of training young men for diplomatic and mercantile positions in Oriental countries. In these schools instruction is given, partly by European scholars of acknowledged eminence and partly by native teachers, in the principal languages of Asia, Malaysia, and Africa, and in the geography, history, civil and religious institutions of these countries. Practical instruction in modern European languages is also given, and lectures on law are usually added. With few exceptions they are under direct governmental control. The oldest institution of this sort is the *Kaiserlich-königliche Consular-Akademie* of Vienna, founded by the Austrian Government in 1754 for the education of promising candidates for the diplomatic service. It is under the direction of the Ministry of Foreign Affairs, and embraces both an Oriental and a Western section. In addition to the regular courses of instruction, the students, whose number is limited to twenty-five, are trained in gymnastics, swimming, horsemanship, fencing, and other accomplishments. The *Kaiserliche-Königliche öffentliche Lehranstalt für orientalische Sprachen*, established at Vienna in 1851, has a much wider scope and is open to all students looking forward to a career in the East, whether in a public or private capacity. Of similar character is the *Ecole spéciale des langues orientales vivantes* of Paris, founded in 1795, and now under the direction of the Ministry of Education. In this school special attention is paid to the languages spoken in the French colonial possessions in Africa and in the East. In Russia, an Oriental department has, since 1854, been attached to the University of Saint Petersburg, and courses are offered in the principal languages of Asia, including those of China, Korea, and Japan. The great extension, since 1870, of Germany's commercial interests in the East and the development of her colonial policy led to the establishment, in 1887, of the *Seminar für orientalische Sprachen* attached to the University of Berlin. Here the languages of Eastern Africa are taught in addition to those of Western Asia and the far East. In England instruction in modern Oriental languages has long been given at the University of Cambridge, and in London the School of Modern Oriental Languages, now incorporated with the University of London, has been in successful operation for some years. Special attention is paid to the languages spoken in the Indian Empire. The School of Tropical Medicine, founded through the interest of the Hon. Joseph Chamberlain, and the Oriental Faculty of the College of the Propaganda at Rome (see MISSIONS, CHRISTIAN) may also be mentioned in this connection. Several of these institutions issue publications of much value. The

Government of the United States has, as yet, taken no steps toward the establishment of a school for Oriental studies, but instruction in modern Oriental languages is given in some of the leading universities. At the Johns Hopkins University, Baltimore, courses in modern Arabic, Persian, and Turkish have been offered since 1891, and in the languages of the Philippine Islands since 1900. At Columbia University, New York, a chair of Chinese has recently been founded.

ORIENTAL SOCIETY, American. One of the oldest learned societies in America, founded September 7, 1842, and chartered under the laws of Massachusetts, with the object of promoting Oriental research in all its branches. It meets annually for the reading and discussion of papers and for the transaction of the general business of the society, and, by the terms of its constitution, at least one meeting in three years must be held in Massachusetts. At each meeting a special session is devoted to papers on the historical study of religions. The society possesses, at Yale University, a library comprising some 5000 volumes and a considerable number of manuscripts, and publishes a journal, issued annually in two parts, which contains many valuable contributions to Oriental philology, history, and archæology. Among the presidents of the society, which has exercised an important influence on the development of Oriental studies in America, have been the well-known scholars Theodore Dwight Woolsey and James Hadley of Yale, the celebrated Sanskritist W. D. Whitney, the eminent archæologist William Hayes Ward, of New York, and President Daniel C. Gilman, of the Carnegie Institution, Washington, D. C. In 1903 the society had a total membership of about 350.

ORIENTATION. Determination of the points of the compass with regard to the observer's position; and in ecclesiastical architecture, the arrangement of a sacred edifice in such manner that its axis may have a particular direction, usually toward the east. In a primitive state of culture, it was felt that especial efficacy attached to prayers made at dawn, and delivered toward the rising sun; hence in building temples, provision was often made for an entrance constructed to allow the first sunbeams to fall on the statue of the god, before which stood the altar. As the sun daily changes his place of appearance, choice might be made of his position at the time of the solstice or equinox. In Greek and Roman temples, although the eastward direction was most usual, exceptions occur, determined by various considerations. Hence the practice passed to Christianity, and it became customary so to arrange churches, especially among Oriental Christians. From the early centuries of the faith, it had been usual in prayer to face the east, and in burial the body was generally laid with the head to the west, so that in the resurrection the person might front the east. Such a practice is by no means peculiar to mediæval Christianity, but is common among savages as well.

ORIENTATION. A term, belonging partly to psychology and partly to physiology, which signifies a normal adjustment of the organism to its spatial environment. We are 'orientated' when we can govern the position of our body (stand up, sit down) with reference to changing spatial requirements, and when we 'have our bearings' as motor organisms, knowing right from left, and being able to move in any required direction. Orientation thus covers the maintenance of bodily equilibrium and the control of locomotion. The factors that determine it are manifold, and are both sensory (psychological) and reflex (physiological). We may mention sensations of vision, sensations from skin, joints and muscles of limbs and trunk—e.g. sensations from the soles of the feet, from the weight of the trunk pressing the hip sockets—reflexes of the eye muscles (attended in certain circumstances by muscle sensations), tactual and visual reflexes, and above all the sensory and reflex mechanism of the semicircular canals and vestibule of the internal ear. (See Static Sense.) As a rule, orientation is unconscious or at best but dimly conscious. Removal or derangement of any important factor, however, brings it definitely to consciousness: the effect of anæsthetizing the soles of the feet is very marked, and we all know the difficulty of keeping the head erect when we become drowsy. The governing reflexes may be disturbed by drugs, as in alcoholic intoxication; and in various forms of mental disorder the power of orientation is more or less completely abrogated.

Animals, in orientating themselves, are guided by their senses, and thus have the sense of direction. (See Tropism.) The dog finds his food mainly by the sense of smell, and this more than any other sense leads animals in their quest for food to move from one place to another. The sense of direction may also include the phenomena of migration, and the homing instincts of animals and the wonderful power exercised by savages and hunters in finding their way through a trackless forest or desert.

By means of the sense of touch we direct our attention to any part of our body which may receive a blow or any impression from without. The existence of a muscular sense is denied by Bonnet, who, however, calls in the existence of what he calls 'a sense of segmental attitudes,' which is the faculty we possess of knowing how instantly to orientate any single part of our body in relation to all the others. It is a primitive attribute of the tactile sense.

The tactile sense is the most generalized of all the senses, and tactile organs are to be found in all animals, in the shape of hairs, bristles, tentacles, and feelers of various sorts. The skin is especially sensitive to touch. Many of the lower and blind animals feel their way, as in the case of earthworms, the maggots of flies, and eyeless myriapods. In mollusks Nagel has found that certain eyeless bivalves and snails he experimented with showed a high degree of sensitiveness to light; some species reacted especially to diminution, others to increase of light.

The marginal tentacles of certain medusæ (q.v.), besides being organs of touch, also contain minute calcareous bodies (otoliths); in other medusæ corresponding organs have grown in or become invaginated, forming marginal sense-organs. The otoliths may either be situated at the end of a stalk, or remain free in the cavity containing them, which is called an 'otocyst.' These otocysts are organs of the sense of attitudes and of movements, and they also aid in directing the

movements of the body in approaching their prey or in escaping from their enemies.

Other kinds of organs of orientation which have excited much interest are the 'lateral organs' of salamanders, of which some contain otoliths, while those of the lateral line of fishes open externally or are closed. These organs, which occur only in aquatic animals, are supposed to afford a perception of variations of water pressure, and have by some been thought to be the organs of a sixth sense. They occur on the head and also along the side of the body. Like the marginal organs of medusæ, they tend to be invaginated and to form in their interior a liquid medium in which the movements peculiar to the animal may determine variations in pressure or of true friction between the sensible wall and the refractory liquid mass, by its fluidity and inertia immediately following the movement of the wall. These beatings or vibrations, impinging on the walls of the otocyst and causing movements of the delicately poised otolith, are the functional mode which takes place in the action of the canaliculär structures (lateral canals, labyrinth) from which have evolved the ear of fishes and other vertebrates. Instead of a series of sensorial papillæ more or less salient or invaginated, we first find a furrow, then a lateral canal, still in places in communication with the liquid exterior, and along whose wall may be distributed the papillæ of the lateral sense. We actually find in the otocyst of cephalopods furrows which are regarded as the precursors of the canals of the labyrinth of the ear, so that this sort of otocyst may be regarded as the prototype of the labyrinthine structures of vertebrates. But in the latter the organ of the lateral line is greatly developed. Each organ is an ectodermic papilla which has become invaginated and sunk down into the skin, whose growth converts the organ into a closed otocystic vesicle, in whose walls are new ingrowths of secondary papillæ with bent furrows formed like the furrow of the lateral line. These become curved canals comparable to canals of the lateral line, and produce an analytic decomposition of the slightest vibrations between the walls and the contained inert fluid, each furrow, each canal being very sensitive to the vibrations in one direction, and insensible to all the others. The pairs of sensitive cranial nerves sent to the lateral organs are the fifth, seventh, ninth, tenth, then the lateral continues. The eighth pair is wholly supplied to this marvelously differentiated lateral organ, which becomes the labyrinth of the fish's ear. In all the higher vertebrates the labyrinth of the ear consists of three canals, a sagittal, a transversal, and a horizontal one. Bonnet concludes by saying that in man the labyrinth of the ear, i.e. the apparatus of the semicircular canals, furnishes the notion of attitudes and of variations of attitudes of the head, together with a notion of the swiftness, direction, and duration of these variations. Moreover, it is not sufficient to know from what direction any sound reaches either of one's ears—it is also necessary for one to know the orientation of the two auditory fields, i.e. the position of one's head at this time so as objectively to orientate the origin of the sound.

Some authorities (Crum-Brown, Lloyd Morgan) believe that by means of the semicircular canals we can appreciate acceleration of rotatory motion, and also acceleration of movements of translation—forward or backward, up or down—while Morgan suggests that otocysts of invertebrates may be regarded as organs for the appreciation of changes of motion, "and the sense of hearing may be a refinement of the sense through which changes of motion are appreciated."

Consult: Bonnier, *Coriolisation* (Paris, 1900); Hartmann, *Die Orientierung* (Leipzig, 1902); Loeb, *Comparative Physiology of the Brain*, etc. (New York, 1902); Stratton, "Cutaneous Sensation," in *Psychological Review*, vol. iv. (New York, 1897).

ORIFLAMME, or'i-flam, or **AURIFLAMME** (Fr., from Ml., *aurea flamma*, from Lat. *aurī flamma*, flame of gold). A banner which originally belonged to the Abbey of Saint Denis, near Paris, and was borne by the counts of Vexin, patrons of that church, but which, after the County of Vexin was united with the French Crown, became the principal banner of the kingdom. It was charged with a saltire wavy, or with rays issuing from the centre crossways. In later times the oriflamme became the insignia of the French infantry. The name seems also to have been given to other flags; according to Nicolas, in his *History of the Battle of Agincourt* (London, 1827), the oriflamme then borne was an oblong red flag split into five parts. It does not seem to have been carried into war later than this battle (1415).

ORIGANUM. An herb. See MARJORAM.

ORIGEN (Lat. *Origenes*, from Gk. Ὠριγένης, probably Son of Horus, an Egyptian god), also called ADAMANTIUS (c.185–c.254). The most famous Christian writer and teacher of the third century. He was born in Alexandria about the year 185. His parents were Christians, and his father, Leonidas, suffered a martyr's death under Septimius Severus (202). Origen would gladly have died with him had he not been prevented by his mother. The boy was educated at the famous Alexandrian School, where he had Clement as his master. His remarkable abilities were early manifest, and at the age of eighteen he was appointed to succeed Clement as head of the catechetical school. In obedience, as he supposed, to the command of Matthew xix. 12, Origen made himself a eunuch, and his daily life was governed by an extreme asceticism. Leaving Alexandria during the persecution under Caracalla (216), he traveled widely, visiting Jerusalem and Cæsarea, where, at the invitation of the Bishops Alexander and Theoctistus, he lectured on the Scriptures, although he had not been ordained. This called forth a rebuke from Demetrius, Bishop of Alexandria, who summoned him to return home. For several years Origen devoted himself assiduously to teaching and writing, his reputation increasing rapidly. Jerome says that he wrote more books than other men can read, and Epiphanius places their total number at six thousand. During another visit to Palestine in 231, Origen was ordained presbyter by Alexander and Theoctistus, which aroused the bitter animosity of Demetrius. Jealousy mingled with theological antagonizing the suspicions of [illegible] some entertained against him, and [illegible] were held in Alexandria (231 et seq.) at which he was deposed from the priesthood [illegible] to return-

The churches of Palestine, Phœnicia, Arabia, and Achaia refused to recognize his deposition. Henceforward Origen resided in Cæsarea, where he succeeded in raising the school of that place almost to the height of fame which Alexandria had reached. During the persecution of the Emperor Decius (250 et seq.) he was imprisoned and tortured, and although he was released on the death of the Emperor, he died from the effects of his injuries about 254, being then in his seventieth year.

Origen was the greatest theologian and biblical scholar the Church up to that time had produced. He is sometimes called the father of the allegorical method of interpreting the Scriptures, for although the method did not originate with him, yet he, with Clement, perfected its Christian application, and gave it a far larger currency than it had ever had before. He taught the principle of the three-fold sense, corresponding to the three-fold division of man into body, soul, and spirit, which was then so common. As an exegete and student of the text, Origen did far greater service. In his *Hexapla* (q.v.) he presented the Old Testament in the original Hebrew, with a Greek transliteration, and the Greek versions of the Septuagint, Aquila, Symmachus, and Theodotion, all arranged in six parallel columns. His exegetical work was partly in the form of homilies, on both the Old and the New Testament, and partly in that of *Tomoi*, or commentaries in the stricter sense of the term, which covered a wide range. His theology was presented to the world in a treatise entitled Περὶ Ἀρχῶν, known to us in its completeness only in a Latin version made by Rufinus and entitled *De Principiis*. Unfortunately, Rufinus felt called upon to alter the text wherever it seemed to him heretical, so that what we have is not a translation, but a modified Latin version. Origen's theological views are further illustrated in his long apologetic work, *Against Celsus*, which is on the whole the most important Greek apology we possess.

Origen's greatest service to Christian doctrine lay in his development of the Logos Christology. In Jesus Christ we learn to know the Incarnate Word (Logos). But from this conception, through speculative thought, we rise to that of the Logos-not Incarnate, or the Pre-existent Logos, through whom in turn we mount to God Himself, the goal of all theology. To preserve the idea of God as absolute and eternal, whatever is closely related to Him—as the Son is, and as the creation is—must be pictured to our minds *sub specie æternitatis*, from the point of view of eternity or infinity. It is wrong to think of Christ as an emanation from God (the Gnostic doctrine), for that involves succession in time. We should rather think of Him as eternally projected. To illustrate his thought Origen used the metaphor of a torch and its light, or a mass of iron glowing with heat. In this fashion he avoided the two perils of Gnostic emanation, on the one hand, and Monarchian identification, on the other. (See GNOSTICISM; MONARCHIANS.) But while teaching that the Son was eternally begotten, a doctrine which was perpetuated in the dogma of the Trinity, Origen also taught that the Son was subordinate to the Father in power and dignity, and this idea was later used against him, after Arianism (see ARIUS) had appeared as a threatening heresy. Origen's doctrine of an eternal creation, with periodic cycles of decay and renewal for our world, was not generally accepted by the Church. Nor was his restorationism accepted, according to which all mankind should at last return to a state of innocency and be acceptable unto God, although something like it was afterwards taught by Gregory of Nyssa in the fourth century. The school of Origen, which included Dionysius of Alexandria, Gregory Thaumaturgus, Eusebius of Cæsarea, John of Jerusalem, Jerome (in his early period), and others, was very influential for many years, but in the fourth century it was attacked by Epiphanius, and the Origenists were thenceforward regarded as heretics and combated fiercely.

The best edition of Origen's works is that now in process of publication by the Berlin Academy in *Die griechischen christlichen Schriftsteller der ersten drei Jahrhunderte; Origenes Werke*, vols. i. and ii., edited by Koetschau (Leipzig, 1899). An older edition is by Lommatzsch (25 vols., Berlin, 1831-48). An English translation of the most important works is given in the *Ante-Nicene Fathers*, vols. iv. and ix., edited by Roberts and Donaldson (New York, 1887-96). In general, consult: Harnack, *History of Dogma*, vol. ii. (London, 1896); Krüger, *History of Early Christian Literature* (New York, 1897); Fairweather, *Origen and Greek Patristic Theology* (ib., 1901); Rainy, *The Ancient Catholic Church* (ib., 1902).

ORIGINAL PACKAGE (OF., Fr. *original*, *originel*, from Lat. *originalis*, original, from *origo*, origin, from *oriri*, to arise; connected with Gk. ὀρνύναι, *ornynai*, Skt. *ar*, to arise). With reference to interstate commerce, the package in which goods are shipped. The term has a special significance arising out of a line of decisions of the United States Supreme Court, deciding questions raised by the attempts of the various States to prohibit or regulate the sale of intoxicating liquors, cigarettes, and other commodities on the ground that they are injurious to public health and morals. The cases in which these questions were raised are known as the 'Original Package Cases.' The 'interstate commerce clause' of the United States Constitution provides that Congress shall have power "to regulate commerce with foreign nations, and among the several States," etc. A State can regulate the domestic manufacture and sale of commodities, under its police power, and, therefore, in the so-called 'prohibition States' the manufacture and sale of intoxicating liquors was practically prohibited. This led to the importation of liquors from other States, and seizures by the State officers. The United States courts held that where an article is imported into one State from another, it does not lose the protection of the interstate commerce clause until it has become intermingled and incorporated into the general mass of property of the former, but in such event it becomes subject to the laws of that State. Further, that while goods remained in the original packages, cases, barrels, etc., in which they had been shipped, and while in the hands of the importer, they had not become so intermingled, and remained subjects of interstate commerce protection. The importance of such decisions lies in the fact that such an interpretation of the law gives ample

opportunity to evade State laws, under the technicality of selling goods in the original packages directly to consumers. Such a sale deprives the goods of the protection above mentioned, but as the goods are thereby placed in the hands of the actual consumer, this is immaterial. After goods in original packages have been sold by the importer, they become subject to the State laws. However, a liberal interpretation of what constitutes an original package enables dealers to import the otherwise prohibited articles and retail them. For example, liquor in bottles has been held to be in original packages. However, if the bottles were inclosed in a case, the latter would be the original package, and the importer could not retail the bottles without conforming to the State laws. An original package was finally defined to be any covering, case, wrapping, or receptacle in which an article is inclosed for transportation.

By an act of Congress, approved August 8, 1890, known as the 'Wilson Law,' it was provided that all intoxicating liquors imported into a State shall on their arrival be subject to the laws and regulations of that State, enacted in the exercise of its police power, in the same manner as if they were produced there, and shall not be exempt by reason of having been introduced there in original packages. The purpose of this law was declared by the United States Supreme Court to be to prevent the sale of liquor in original packages in violation of State laws, and it effected a radical change in the law in this respect. However, a number of decisions have held that such State regulations must be strictly confined to the police powers of the State, such as requiring liquors to be sold within certain hours, etc. A license tax on imported liquors in original packages or otherwise, which seemed to have no other object than to provide revenue for the State, was held void, as being a tax on interstate commerce.

The law as to all other commodities in original packages remains the same as before the above act, and is still of great importance in its bearing upon laws prohibiting the sale of cigarettes, etc.

ORIGINAL SIN. The native corruption of man, resulting in universal sin, and itself conceived as partaking of the nature of sin. The period of elaborate discussion of this subject, eventuating in a comprehensive doctrine of sin, fell in the first third of the fifth century; but the elements of the doctrine had been held from the beginning in the Church both of the East and the West. The earliest fathers are full of expressions teaching the universality and persistence of sin, and ascribing it in some indefinite form to a deep-seated origin in the nature of man. An early difference appeared between the Latin and the Greek Church on account of the general emphasis which the latter laid upon the intellectual and the former upon the practical. The Greeks emphasize more the freedom of man, the Latins his practical bondage to evil. It has therefore often been said that the Greeks had no doctrine of original sin; but they teach an original state of righteousness, accept the fact of the fall, and view this as not only bringing man under the dominion of the devil, but as producing a tendency to sin. This tendency arises from the obscuration of the intellect, the weakness in reference to the good, and the ascendency of the sensuous nature over the higher powers and faculties, which have resulted from Adam's sin. At the same time, freedom is carefully guarded, and the more so because of the conflict which these early fathers were waging with the Gnostics. (See GNOSTICISM.) Man still has the power to choose the good as well as the evil. Otherwise he would not be responsible. Grace is necessary to repentance, but it is styled an 'assistance.' Origen referred the universality of sin to the self-corruption of all human spirits in a previous state of existence. The Latins, while in general acknowledging the same fundamental truths as the Greeks, throw the emphasis upon the concrete facts of sin and grace. Tertullian approached the later Latin view. The premises of the doctrine lie in his psychology (see TRADUCIANISM) and his doctrine of the original condition of man. Man was created good, but not perfect. By his sin he became corrupt, and this corruption propagates itself by natural generation among his descendants. Hence every child of Adam is impure and subject to death. Grace is no mere 'assistance,' but it is a creative and transforming power. In this general position the Latin fathers of this period generally concur.

The discussion was carried on in the fifth century by Pelagius and Augustine (qq.v.). The main positions of the latter were embodied in the result of the Council of Orange (529), which declared that by the sin of Adam free will has been so perverted and weakened that fallen man is incapable, without the initiative of divine grace, of performing meritorious acts leading to salvation, and hence this doctrine passed into the theology of the Middle Ages. A milder view sprang up immediately, which was termed the 'Semi-Pelagian' (q.v.), which gave the initiative in conversion now to man, and now to God, and hence greatly modified the doctrine of the effect of the fall upon the will. The doctrines of the Semi-Pelagians were condemned at the Council of Valence (530). The Council of Trent (q.v.) defined original sin in substantially the same way as the Council of Orange, but elaborated and expanded it, and its definition is the accepted doctrine of the Roman Catholic Church.

The Reformers adhered to the strict Augustinian doctrine, often surpassing Augustine by their extreme forms of statement. They were deeply impressed with the enormity and pervasiveness of sin, and with the entire dependence of man upon the grace of God for the creation within him of the least tendency toward good. The history of the doctrine presents, therefore, little but the reaffirmation of Augustinian positions, and may be summarized in the result formulated by the Westminster Confession (chap. vi.), which stands here for most of the Reformation creeds. "Our first parents . . . . by this sin . . . became dead in sin and wholly defiled in all the faculties and parts of soul and body. . . . The guilt of this sin was imputed and the same death in sin and corrupted nature conveyed to all their posterity. . . . This corruption of nature during this life doth remain in those that are regenerated; and although it be through Christ pardoned and mortified, yet both itself and all the motions thereof are truly and properly sin." Consult the literature under AUGUSTINE; also the Systems of Doctrine.

particularly Charles Hodge, *Systematic Theology* (New York, 1871-73); Landis, *The Doctrine of Original Sin* (Richmond, 1885).

ORIGINAL WRIT. In English legal practice, a writ issued under the great seal, and directed to the sheriff, requiring him to command an alleged wrong-doer to satisfy the complaint of his accuser or to appear in court and answer the complaint. These writs were formerly regarded as the direct mandate of the King (whence the name) issued through his chancellors; but they have been abolished in England, where the statutory process of summons is used to begin all civil actions. In the United States they have never been in use. The term is sometimes improperly given to the first writ or process issued in an action under the modern procedure, which is not an original writ, but a process of the court. See PROCEDURE: WRIT.

ORIGIN OF SPECIES. See DARWIN, CHARLES; NATURAL SELECTION.

ORIGNAL, ô'rê'nyäl' (probably of North American Indian origin). A French-Canadian name for the moose (q.v.).

ORIHUELA, ō'rē-wā'lä. A city of Southeastern Spain in the Province of Alicante (Map: Spain, E 3). It is situated 12 miles northeast of Murcia, on the banks of the Segura, in a plain remarkable alike for its beauty and fertility. It is a long and straggling city. Its palm-trees, square towers, and domes give it an Oriental appearance. It contains a small Gothic cathedral and a handsome bishop's palace. The manufactures include silk, linen goods, and hats; flour and oil mills and tanneries are in operation. Population (commune), in 1887, 24,364; 1900, 28,335.

ORIL'LIA. A town and summer resort of Simcoe County, Ontario, Canada, on the Grand Trunk Railway, at the head of Lake Couchiching (Map: Ontario, D 3). It has manufactures, carries on a thriving trade, and is frequented for its picturesque situation and the good angling the lake affords. It contains a provincial asylum and has two fine parks. A narrow strait connects Lake Couchiching with Lake Simcoe, and steamers ply on the lakes. Orillia is the seat of a United States consul. Population, in 1891, 4752; in 1901, 4907.

ORIL'LON (Fr., almonds of the ears, from *oreille*, ear, from Lat. *auricula*, diminutive of *auris*, ear). A term used in the earlier systems of fortification to describe a semicircular projection at the shoulder of a bastion, designed as a screen for guns and men posted on the flank. It is mostly found in the works of Pagan and Speckle.

ORIN'DA. THE MATCHLESS. The nickname of the English poet Katherine Philips (q.v.).

ORINOCO, ō'rē-nō'kō. The smallest of the three great rivers of South America (Map: Venezuela, D 2). The main stream runs wholly within Venezuelan territory, except for a short distance in its middle course, where it forms the boundary between Venezuela and Colombia. It rises on the Parima uplands near the Brazilian frontier, and flows first northwest to the Colombian boundary, then north into Central Venezuela, and finally eastward until it empties into the Atlantic Ocean through a large delta beginning near the boundary of British Guiana. The total length of the main stream is 1490 miles. Its course forms a large curve around the edge of the Parima plateau; hence its right banks are generally higher, and the tributaries received from that side smaller, while on the left side are the large plains or *llanos* (q.v.), and through these are received several tributaries equaling or exceeding the main stream. About 150 miles from its source and 920 feet above sea level the Orinoco branches, sending one-sixth of its volume into the Cassiquiare, which flows into the Rio Negro, an affluent of the Amazon. The remainder flows as a navigable river until it is broken by the romantic Maypures and Atures rapids, 870 miles from its mouth. These rapids are the only serious obstruction in the main stream, which below them flows with a very gentle current over a bed so nearly level that the tides are felt at Ciudad Bolivar, 260 miles from the sea. Though the country around the upper courses of the river and its tributaries is heavily forested, the lower reaches traverse open savannas where only the banks are lined with trees, and where the adjacent country is periodically flooded so that the natives are compelled to live in pile dwellings. The marshy but heavily forested delta occupies an area of 7000 square miles, and has a coast line of nearly 200 miles, through which upward of 50 channels enter the ocean. Many of these shift their beds, but seven are permanently navigable for large vessels. The principal navigable tributaries of the Orinoco are the Guaviare, the Meta, and the Apuré (qq.v.), and the total navigable length of the system is 4300 miles. This great waterway, however, is but little used, since the adjacent regions are thinly inhabited, and the great natural wealth practically untouched. In 1900 only one steamer of the Royal Mail Steamship Company plied once every two weeks between Trinidad and Ciudad Bolivar. Smaller steamers continue the service as far as Nutrias on the Apuré, but above the Apuré confluence there is no regular navigation. Consult: Humboldt, *Travels in South America*, trans., Bohn Library (London, 1877); Chassanjon, *L'Orénoque et le Caura* (Paris, 1889); Triand, *Down the Orinoco in a Canoe* (London, 1902); Guzman, "La exploración del Orinoco," in *La España Moderna*, vol. clxvi. (Madrid, 1902).

O'RIOLE (OF. *oriol*, from Lat. *aureolus*, golden). Any of several small birds whose plumage is yellow or orange and black. It was given first to the Old World family Oriolidæ, and was naturally transferred to the American hangnests by early English travelers and settlers on account of the similarity in colors. The American orioles belong to the family Icteridæ, and form the subfamily Icterinæ, in distinction from the blackbirds, bobolinks, and meadow larks, from which the orioles differ in the extremely acute, sometimes decurved bill, comparatively weak feet, and non-gregarious, arboreal habits. They are agreeable songsters, possess notably handsome plumage, and are renowned as architects. As their nests are usually pensile, the birds are often called 'hangnests.' They are especially characteristic of tropical America, where they go by the name of 'caciques,' or, in Jamaica, 'banana-birds.' The best-known species is the Baltimore oriole (*Icterus galbula*), which ranges in summer as far north as the southern provinces of Canada,

but winters in Central America. Its name was given to it by Linnæus, whose first specimen came from Maryland, in complimentary allusion to the fact that the colors of the male were those of the livery of Sir George Calvert, the first Lord Baltimore, then proprietor of that colony. The gay plumage has also caused it to be called 'golden robin,' 'fire-bird,' and 'fire-hang-bird.' The male is about eight inches long, brilliant fire-orange, with the whole head, neck, back, wings, and middle tail-feathers black, and with considerable white on the wings. The female is somewhat smaller, much paler, and with the black more or less obscured by olive. The young resemble the female, and do not assume their full plumage before the second year. The Baltimore oriole is one of the most conspicuous birds that the spring migrations bring into the Northern United States, not merely because of the splendor of his plumage, but because of his loud, musical whistle. The food consists chiefly of insects, although fruit and young peas and similar delicacies are eagerly accepted when in season, and ripening grapes are injured to a serious extent in the Hudson Valley and certain other localities. See Colored Plate of SONG-BIRDS with THRUSH.

The nest of the Baltimore oriole (see Plate with NIDIFICATION) is the bird's greatest claim to distinction. This admirable structure is woven into the tip of a branch, preferably the drooping limb of an elm or willow, from which it hangs at some distance from the ground: though other trees are frequently used, the elm is the favorite, as the long, drooping branches afford an ideal location for a hanging nest. The construction of the nest is mainly if not entirely the work of the female, the principal materials being grass, slender strips of bark, strings, hair, and vegetable fibres. These are all closely and very firmly interwoven into a pouch, four or five inches in depth. The eggs are four to six in number, not quite an inch long, white, spotted, scrawled in a curious manner with irregular lines of black or brownish.

Another oriole, which does not range quite so far north or west as the Baltimore, and which is much less conspicuous, though the male is very handsome, is the orchard oriole (*Icterus spurius*). A much quieter and more retiring bird than his showy cousin, the orchard oriole is not so often seen or heard, but his song is a more finished product and more melodious. The male is chestnut, with the head and fore parts of the body black, while the female is olive-green and dull yellow. The young resemble the female and the males do not assume full plumage until the third year. The nest is made of grasses, and is not so perfectly pendent as is the Baltimore oriole's. The eggs are similar to those of the latter, but are somewhat smaller and not so much scrawled. (See Plate of EGGS OF SONG BIRDS.) Of the remaining 35 or 40 species, prominent examples are the 'troopial' (*Icterus icterus*), a tropical species common in South America, about ten inches long, bright yellow and black; the black-headed oriole (*Icterus melanocephalus*), another large, rich yellow and black species, occurring in Mexico, a variety of which, known as Audubon's oriole, is found in the lower Rio Grande Valley; and Bullock's oriole (*Icterus Bullocki*), a species very similar to the Baltimore bird, which replaces that species in the Far West. See also CACIQUE—a closely allied group.

Consult Ridgway, *Birds of North and Middle America*, part ii. (Washington, 1902), and American ornithologies generally.

The orioles of the Old World are a small family of about 40 species, the Oriolidæ, related to the crows. They are characteristically Oriental and Australian, though several species occur in Africa, and one ranges throughout Europe. This is *the* 'golden' oriole (*Oriolus oriolus*), somewhat larger than the Baltimore oriole, and equally brilliant. The song is marvelously rich and flute-like, but very short. A very similar Oriental species is the familiar *Oriolus Kundoo*, or 'mango-bird.' The outward likeness between these Old World orioles and the American hangnests is increased by the fact that the former also build somewhat pensile nests. The 'mimicry' between them and certain honey-eaters (Meliphagidæ) is another very interesting circumstance, described at length by Wallace, Newton, and Salvadori. Consult Evans, *Birds* (London, 1900).

ORI'ON (Lat., from Gk. Ὠρίων). In Greek legend, a giant hunter; also the name of a constellation. In the Homeric poems Orion appears as the name of a constellation, conceived as a hunter who is watched by the bear, and of a handsome hero, beloved by Eos and slain by Artemis, but there is no hint of a connection between the two stories. Later writers preserve a multitude of local legends about Orion, which cannot be united into a consistent narrative. In Bœotia he enjoyed special fame, as a hunter of mighty strength, who, while reputed son of King Hyrieus, was borne from the earth by the intervention of three gods. A Cretan version made him the son of Euryale, daughter of Minos, and Poseidon, who gave him the power of traversing the sea. Here also he appears as a hunter and the chosen companion of Artemis and Leto. The Chians connected him with their local hero Œnopion, for whose daughter Merope he became a suitor. Here too he, with the aid of Artemis, cleared the land of wild beasts, but Œnopion still refused to give him his daughter, and finally by strategy blinded him; according to one version, because Orion in drunkenness had offered violence to Merope. Orion forced a boy to guide him to the rising sun, whose rays, falling full upon his eyes, restored their sight, or was helped to this cure by Hephæstus, and returned to take vengeance on Œnopion, who was saved by Poseidon. From the Homeric story of his death was developed a series of stories of his love for Artemis, who slew him when his passion became too violent, or she loved him and only killed him by accident, for Apollo, in his anger at her love, challenged her to hit a black spot on the sea: she shot her arrow and found only too late that it was the head of her lover, who was swimming. In general these myths seem to have no connection with the constellation, but in the following it is difficult not to see astronomical origin. Orion in Bœotia met Pleione and her daughters, and pursued them for five years till they were caught up into the sky as the Pleiades, who still seemed to flee before the giant. In Crete Orion boasted that he would kill all beasts upon the earth, whereupon Gæa sent a scorpion, who killed the hunter by stinging his heel. Artemis set both in the sky, and Orion still hastens to set as he sees the scorpion appear above the horizon.

ORIÓN, ō'rē-ōn'. A town of Luzon, Philippines, in the Province of Bataan, situated near the west shore of Manila Bay, four miles south of Balanga (Map: Luzon, D 8). Population, in 1896, 10,373.

ORIS'KANY, BATTLE OF. In American history, a battle fought about two miles west of Oriskany, N. Y., on August 6, 1777, during the Revolutionary War, between about 800 American militiamen under General Herkimer (q.v.) and an equal force of Loyalists and Indians under Sir John Johnson (q.v.) and Joseph Brant (q.v.). The Americans, while on their way to relieve Fort Schuyler (on the site of Rome, N. Y.), fell into an ambuscade in a deep ravine, but fought Indian fashion and with the utmost bravery for several hours, and finally drove the enemy from the field. The battle greatly crippled Saint Leger (q.v.), who soon afterwards, alarmed at the approach of Gen. Benedict Arnold, rapidly retreated into Canada, thus abandoning the plan of campaign which had been drawn up by General Carleton and which provided for his effecting a junction with General Burgoyne and General Howe or General Clinton at Albany. In proportion to the numbers engaged it was one of the bloodiest battles of the war, more than a third of the contestants being killed or wounded on each side. General Herkimer was mortally wounded early in the action and died several days later. Consult: Dawson, *Battles of the United States* (New York, 1858); and Stone, *Life of Joseph Brant, Including the Indian Wars of the American Revolution* (ib., 1838).

ORISKANY STAGE. A division of the Lower Devonian, named from the type occurrence at Oriskany, N. Y. It is found in the central and eastern parts of New York, and extends southward along the Appalachians into Virginia. It attains a thickness of 200 feet in many places, and consists of sandstones and calcareous shales. It is usually found in association with the Lower Helderberg rocks. The formation is of economic importance in Virginia, where it yields iron ore. See DEVONIAN SYSTEM; GEOLOGY.

ORIS'SA (Skt. *Odra*). A former kingdom on the east coast of Hindustan, which extended from Bengal—a part of which it included—on the north to the banks of the Godavari on the south, and from the coast on the east to Gondwana on the west, embracing an area much larger than that of the region which now bears the name. The authentic history of Orissa begins with the foundation of the Kesari, or Lion, dynasty, about A.D. 474. The Hindu rulers of the land were always Brahmanical rather than Buddhistic in religion, and they possessed a high degree of culture and civilization. Orissa maintained its position as an independent monarchy till the sixteenth century, when the Mohammedans began to harass the country. Finally, in 1568, the last independent King of Orissa was defeated by Soleiman, the Afghan King of Bengal, under the walls of Jaipur, and in 1578 the Afghans in their turn were forced to surrender Orissa to Akbar, and it remained a portion of the dominions of the Great Mogul until 1751. In 1742 the Mahrattas began wresting the country from the declining power of the Mogul emperors, and in 1751 Orissa became a Mahratta province. The Great Mogul ceded his rights to the East India Company in 1765. Under the Mahrattas the condition of the country was wretched in the extreme, and in addition to the distress caused by their lawlessness Orissa was ravaged by famine in 1770 and again in 1777. In 1803 the Mahratta power was crushed and Orissa became an English possession. Revolts took place in 1804 and in 1817-18. An agreement was made between the East India Company and the native chiefs and princes by which the former bound themselves to perform certain services for the country (as maintaining the river banks in good repair), while the latter engaged to pay a yearly tribute. Of the many principalities into which Orissa was divided, a large number fell into arrears with the Government, and the result was that numbers of the estates were sold, and the Government, as a rule, became the purchaser. Much of the territory originally forming a portion of this kingdom thus fell into the hands of the British. In 1865-66 a terrible famine visited the country. The present British commissionership of Orissa extends from a point a little west of the Hugli estuary to the borders of Madras, and includes the delta of the Mahanadi. It constitutes the southwesternmost portion of Bengal. The British districts have an area of 9841 square miles, and the native States of Orissa, 17 in number, embrace an area about once and a half as large. The British districts had a population, in 1891, of 4,047,352; in 1901, of 4,350,372. The native States have about 2,000,000 people. The hill districts, which nowhere present an elevation of more than 3000 feet, are inhabited by the Gonds, the Koles, the Sourahs, and the Khonds. The irrigation of a large portion of Orissa is provided for by an extensive and costly system of canals taken over by the Government in 1868. The chief towns are Cuttack, the capital, Balasor, an important seaport, and the holy city of Puri.

ORI'THY'IA (Lat., from Gk. *Ὠρείθυια, Oreithyia*. The daughter of the Athenian King Erechtheus. Boreas carried her off to Thrace, and she became the mother of Cleopatra, Calaïs, and Zetes.

ORIZABA, ō'rē-thä'bä (called by the Aztecs *Citlaltepetl*, 'Star Mountain'). One of the highest peaks of North America, exceeded seemingly only by Mount McKinley in Alaska. It is situated on the boundary between the States of Vera Cruz and Puebla, Mexico, 65 miles west of the city of Vera Cruz. It is a beautifully symmetrical volcanic cone rising to a height of 18,250 feet. Its summit is covered with perpetual snow, and in clear weather is visible from ships far out in the Gulf. Forests of oak and pine cover the lower and middle slopes, the former following upon the luxuriant tropical flora. The timberline is found at 13,500-14,000 feet. The summit crater, which is much smaller than that of Popocatepetl, is in a condition of full preservation, and from it at times issue sulphurous and other vapors. The volcano has been quiescent during the past half century. It was first ascended in 1848 by two American officers, Reynolds and Maynard.

ORIZABA. A city in the State of Vera Cruz, Mexico, situated 68 miles southwest of Vera Cruz, on the railroad between that city and Mexico (Map: Mexico, L 8). The town lies in a beautiful valley over 4000 feet above the sea, and partly surrounded by lofty mountains, among which towers the magnificent volcano of Orizaba

(q.v.), 20 miles distant to the northwest. In spite of the high altitude, the climate of the valley is tropical, and especially subject to hot winds from the south. The houses are mostly one-storied, and the town contains few objects of interest. The greater part of the valley is occupied by sugar plantations, and Orizaba is an important centre of the Mexican sugar industry. There are also a number of cotton and flour mills, most of the power being furnished by the Rio Blanco. Population, in 1895, 31,512. Orizaba was an ancient Indian town, and its present name is a corruption of the Nahuatl *Ahuializapan*, meaning 'pleasant waters.' It was for a number of years the capital of the State.

ORKHAN, ôr-kän' (1279-1359). A Turkish Sultan, son of Othman, founder of the Ottoman dynasty. He captured Brusa in 1326, and succeeded his father in the same year. He made Brusa his seat of government. Orkhan married Theodora, a daughter of the Byzantine Emperor John Palæologus, in 1347. He won a footing in Europe (1354), and made extensive gains in Asia Minor. Orkhan may be considered one of the greatest generals of the dynasty.

ORK'NEY ISLANDS. An archipelago lying north of Scotland, and separated from Caithness by the Pentland Firth (Map: Scotland, F 1). It consists of about 70 islands and islets, of which 29 are inhabited. The principal islands are Pomona or Mainland, Hoy, South and North Ronaldsay, Flotay, Burray, Ronsay, Shapinsay, Stronsay, Eday, Westray, and Sanday. The area of the islands is 375 square miles. With the exception of Hoy, which is mountainous, the islands are generally low, with an irregular, partly rocky, partly sandy coast line. The highest hill is the Ward of Hoy, 1555 feet. The rocks are of the Old Red Sandstone formation, except a small granite district near Stromness. The climate is mild owing to the proximity of the Gulf Stream. The annual rainfall varies from about 28 inches on the east side of the isles to 37 inches on the west. The soil is fertile and produces barley, oats, potatoes, and turnips. The inhabitants also engage in cattle, sheep, and poultry raising, and fishing. Live stock, sea food, poultry, and eggs are largely exported. Though Orkney is a separate county of Scotland, it combines with the Shetlands to return one member to Parliament. The only towns are Kirkwall (q.v.), the capital, and Stromness, with a fine harbor admitting the largest vessels, both in Pomona. The population of the islands was, in 1891, 30,450; in 1901, 26,698.

The *Orcades* (whence the modern adjective Orcadian) are mentioned by classical writers, but of their inhabitants almost nothing is known till the Middle Ages. They were probably of the same stock as the British Celts. From an early period, however, the Norsemen resorted to these islands, and in the tenth century they were ruled by independent Scandinavian jarls (earls), but in 1098 they were made subject to the Norwegian Crown. In 1231 the Scandinavian feudal lords were succeeded by Scotch nobles under the overlordship of the Norwegian kings. In 1468 the islands were given to James III. of Scotland as a security for the dowry of his wife, Margaret of Denmark. In 1590 Denmark formally resigned all pretensions to the sovereignty of the Orkneys. The present inhabitants are generally of Scandinavian and Scotch descent. The antiquities include the standing stones of Stennis, the Maeshowe tumulus, and an old Pictish fort.

Consult: Low, *A Tour Through the Islands of Orkney and Shetland* (Kirkwall, 1879); Tudor, *The Orkneys and Shetland* (London, 1883); Wallace, *Description of Orkney* (Edinburgh, 1883); Brand, *A Brief Description of Orkney, Zetland, Pightland Firth, and Caithness* (ib., 1883); Buckley and Haure-Brown, *Vertebrate Fauna of the Orkney Islands* (ib., 1891); Craven, *History of the Church in Orkney, 1662-88* (Kirkwall, 1893); id., *The Church in Orkney, 1688-1852* (ib., 1893).

ORLAN'DO. A city and the county seat of Orange County, Fla., 147 miles south of Jacksonville; on the Plant System and the Florida Central and Peninsular railroads (Map: Florida, G 3). It is a popular winter resort, situated in a healthful region, noted also for its hunting and fishing. There are some manufacturing establishments, but the city is more important as the centre of extensive fruit-growing interests. Population, in 1890, 2856; in 1900, 2481.

ORLAN'DO. (1) The Italian form of Roland, one of Charlemagne's paladins. (2) In Shakespeare's *As You Like It*, a son of Sir Rowland de Bois, brother to Oliver, and Rosalind's lover.

ORLAN'DO FURIO'SO. A famous poem by Ariosto, published in 1516, in forty cantos; revised by the author and enlarged to forty-six, 1532. It was a continuation of Boiardo's *Orlando innamorato* and is professedly a romance of chivalry, though a light irony, like that of Cervantes in *Don Quixote*, can be felt in the treatment. For the sources of the story, consult Rajna, *Le fonti dell' Orlando furioso* (Florence, 1876). See also ARIOSTO.

ORLANDO INNAMORATO, ôr-nä-mô-rä'tô. See BOIARDO.

ORLAN'DUS LAS'SUS. See LASSO, ORLANDO DI.

ORLE (OF. *orle*, *ourle*, Fr. *orle*, from ML. *orlus*, *orla*, diminutive of Lat. *ora*, border, coast). In heraldry (q.v.), one of the charges known under the name of subordinaries.

ORLÉANAIS. ôr'lā'ä'nā'. Formerly a province of Central France, on both sides of the Loire. It is now included mainly within the departments of Loiret, Loir-et-Cher and Eure-et-Cher, while smaller portions belong to the departments of Seine-et-Oise, Sarthe, Indre, Cher, Nièvre, and Yonne.

ORLÉANS. ôr'lā'äN'. The former capital of Orléanais, France, and now the capital of the Department of Loiret, situated on the right bank of the Loire, spanned here by a magnificent bridge, about 70 miles south-southwest of Paris (Map: France, H 4). Orléans lies on a forested plain. It is a well-constructed city, with spacious, regular streets and pleasant squares. The city lies in a compact form, extends along the river lined with quays, and is bordered by a semicircle of connected and broad boulevards of the most modern type occupying the site of the ancient fortifications. There is much curious old timber architecture to be found in the city. The noteworthy late Gothic Cathedral of Sainte Croix dates from 1601. Its impressive façade is of

of the town's attractions. The cathedral contains a decorative monument by Chapu.

The Hôtel de Ville is of brick and stone, dating from 1530. It was reconstructed and enlarged in the last century. In the old Hôtel de Ville are the municipal museums of painting and sculpture and a museum of natural history. In the ancient and artistic Hôtel de Cabut, formerly called in error the house of Diane de Poitiers, is the valuable Historical Museum of Orléans. The house of Agnes Sorel and the house where the Maid of Orleans lodged are still standing. The latter contains the highly interesting Musée Jeanne d'Arc. This collection includes tapestries, statues, portraits, banners, etc., all connected with or illustrating the history of the heroine. Other interesting buildings are the prefecture, the Palace of Justice (1821), and the Hôtel Dieu, which is considered the most attractive hospital in the Republic. Orléans has an equestrian statue of the Maid of Orleans, and a bronze statue of the Republic, erected in 1850. Orléans is on the site of *Genabum*, the Gallic town burned in B.C. 52 by Cæsar to avenge the murder of Roman traders. It was rebuilt by the Emperor Aurelian and named *Aurelianum*, whence its modern name. It was an important place under the Merovingians and continued to flourish under the kings of France; in 1309 it became the seat of a university. During the Hundred Years' War with the English it was distinguished for its loyalty. It was rebuilt by the English in 1428-29, and was relieved by the famous Maid of Orleans—Joan of Arc. It was a Huguenot stronghold during the religious wars, and while besieging it the Catholic leader, the Duke of Guise, was assassinated in 1563. In the Franco-German War of 1870-71 several sanguinary battles were fought in the neighborhood; in October, 1870, it was occupied by the Germans, who were driven out a month later by the French; in December, however, the city was recaptured by the Germans and held until the end of the war. Population, in 1901, 67,311.

ORLEANS, ôr'le-ânz. An island in the Saint Lawrence River, belonging to Montgomery County, Quebec, Canada, a few miles below the city of Quebec (Map: Quebec, F 4). It has an area of 69 square miles, with a population of about 5000. The surface is undulating and covered in some portions with extensive forests. The soil is rich, and in a high state of cultivation, fruit culture being of considerable importance. There are a number of villages. The island is a favorite picnic and summer resort. It was General Wolfe's camping ground prior to the siege of Quebec in 1759. Jacques Cartier, in 1535, named it Isle de Bacchus, owing to the abundance of its grape vines.

ORLEANS. The name borne by a cadet branch of the Valois and Bourbon houses of France. Philip, the fifth son of Philip VI. of France, was created Duke of Orleans in 1344. After his death, without issue, the duchy was bestowed (1392) on Louis, Count of Valois, the younger brother of Charles VI., who thus became the founder of the House of Orleans Valois. Louis was a man of exceptional gifts and great vices and played an important rôle during the tragic period of the Hundred Years' War, when the fortunes of France under its mad King, Charles VI., were at their lowest. He strove with Philip the Bold of Burgundy for the control of the King, and with his wife, Valentina Visconti, was suspected of plotting for the throne. After the death of Philip, Louis was for some time without a rival in the kingdom, enjoyed the favor of Queen Isabeau, but rendered himself unpopular by his extravagance and the licentiousness of his character. The contest against him was renewed by Philip's son, John the Fearless, whose wife Louis had seduced. A reconciliation between the two took place in November, 1407, and three days later Louis was assassinated at the instigation of John. He had eight children by Valentina Visconti and an illegitimate son, Dunois (q.v.), the celebrated bastard of Orleans. Louis's eldest son, Charles, Count of Angoulême and Duke of Orleans (1391-1465), carried on the struggle against the House of Burgundy as head of the party of the Armagnacs. He was taken prisoner by the English at Agincourt and spent twenty-five years in captivity. He was noted as a poet. (See CHARLES OF ORLÉANS.) His son Louis ascended the French throne as Louis XII. (q.v.), and reunited the Duchy of Orleans to the Crown. It was subsequently held by the younger sons of Francis I. and of Henry II. until 1574, when Henry, Duke of Anjou, the last male scion of the House of Valois, ascended the throne of France. Of the bearers of the title belonging to the House of Bourbon the following are the most important:

GASTON JEAN BAPTISTE, Duke of Orleans (1608-60), best known for his talents in conspiracy. He was the third son of Henry IV. of France and of Maria de' Medici, and was born at Fontainebleau, April 25, 1608, being known after 1611 as Monsieur. In 1626 he was made Duke of Orleans, and married Mary of Bourbon, Duchess of Montpensier, the richest heiress in France. In the same year he was involved in the conspiracy of Chalais against Richelieu (q.v.), and basely abandoned his accomplice to his fate. He never ceased, however, to intrigue against the great Minister, and in 1632 raised Languedoc against the King with the aid of the Maréchal de Montmorency. He deserted the latter at the battle of Castelnaudary (September 30, 1632), and made his peace with the Court, while Montmorency suffered torture and death. In 1636 he plotted with the Count of Soissons against the life of Richelieu, but his cowardice led to the discovery of the conspiracy, and Gaston purchased peace at the expense of his accomplices. He was concerned in the conspiracy of Cinq-Mars (q.v.), but upon the arrest of the latter (June 13, 1642) submitted and pleaded for pardon. He became Lieutenant-General of the Kingdom after the death of Louis XIII., and served with credit against Spain. During the Fronde (q.v.) he changed from the Court to the Parlement and to Condé, and in July, 1652, was named by the Parlement Lieutenant-General. With the triumph of Mazarin his political activity came to an end, and he spent the last year of his life in retirement at Blois. By his first wife, who died the year after their marriage, he was the father of the celebrated Grande Mademoiselle, Anne Marie Louise, Duchess of Montpensier (q.v.).

The title of Duke of Orleans was next borne by PHILIPPE, brother of Louis XIV. (1640-1701), the founder of the existing House of Orleans, who had two daughters by his first wife, Henri-

etta Anne of England, and a son and daughter by his second wife, Elizabeth, daughter of the Elector Palatine. The son, PHILIPPE, Duke of Orleans (1674-1723), was Regent of France during the minority of Louis XV. He possessed excellent talents, but his youth was passed in unbridled dissipation. Louis XIV. compelled him to marry his daughter, Mademoiselle de Blois, by Madame de Montespan (q.v.). He displayed great personal courage and military talent during the War of the Spanish Succession in Holland, Italy, and Spain; but his presence in Madrid after his victories (1708) was regarded with apprehension both by Philip V. and by Louis XIV. In consequence of this, he lived for some years in retirement from the Court, spending his time in debauchery and in the study and practice of the fine arts and of chemistry. Louis XIV., having legitimized the Duke of Maine and the Count of Toulouse, his sons by Madame de Montespan, appointed the Duke of Orleans president of the regency, but gave the guardianship of his heir and the command of the household troops to the Duke of Maine; but all this was set aside at his death, and the Duke of Orleans became sole Regent in 1715. He was popular, and his first measures increased his popularity; but the financial affairs of the kingdom were perplexing, and the Regent's adoption of the schemes of John Law (q.v.) led to disastrous results. (See MISSISSIPPI SCHEME.) He formed an alliance with England and Holland in 1717, and expelled the Stuarts from France. In the same year he held the celebrated *lit de justice*, in which he prohibited the Parlement of Paris from meddling with financial or political affairs, and declared the legitimized sons of Louis XIV. incapable of succeeding to the throne. His old tutor Dubois (q.v.), who still possessed an unhappy influence over his former pupil, became Prime Minister, and practically ruler of France; the Regent, who was really a man of high abilities, neglecting all duties and pursuing a course of profligacy perhaps unequaled in history. At the instigation of Dubois, the Regent sacrificed the Jansenists and compelled the Parlement in 1722 to recognize the bull Unigenitus. (See JANSENISM.) After the coronation of Louis XV., February 15, 1723, and the death of Cardinal Dubois in August of the same year, the Duke of Orleans, although disliking public affairs, consented to become Prime Minister, but he held office for only a few months, dying December 2, 1723, a victim of his incessant debauchery. He was succeeded by his son Louis (1703-52), who was followed by his son, Louis Philippe (1725-85).

LOUIS PHILIPPE JOSEPH, fifth Duke of Orleans, known as Egalité, born at Saint-Cloud, April 13, 1747. He was first known as the Duke of Montpensier, and after 1752 as the Duke of Chartres. He became Duke of Orleans after his father's death in 1785. Although possessed of good abilities, the young Duke early fell into a course of debauchery from which he never absolutely emerged. In 1769 he married a rich wife and used the money so acquired to strengthen his popularity with the masses. In 1771 he opposed the Chancellor Maupeou and was exiled from Court for a number of years. He returned in 1774, but failed to find favor with Louis XVI. and the Queen. He commanded the rear of the royal fleet at the naval combat near Ushant in 1778, and made himself popular by advocating the cause of America. His increasing popularity rendered him more and more obnoxious to the Court. In the Assembly of Notables in 1787 he declared against the Ministerial proposals; and when the King sought to overcome the resistance of the Parlement by a *lit de justice*, he protested against the proceeding. On the assembling of the States General, he took the popular side and voted with the extremists in the National Assembly. When the insurrectionary movements began in Paris in 1789 he promoted them by secret agents and money. The Court sent him on an ostensibly diplomatic mission to England, from which he returned after more than six months' absence, in July, 1790, and engaged in new intrigues hostile to the King. He began to find, however, that he was the mere tool of a party who availed themselves of his influence and wealth for their own purposes, and this discovery abated his revolutionary fervor. He withdrew from the Jacobins, was reconciled to the King, and appeared at Court; but was treated with such contempt by the courtiers that he turned once more to the cause of the Revolution. He joined Danton's party, renounced his titles, assumed the name of Philippe Egalité, and was returned to the Convention, in which he took his place with the party of the Mountain. He voted for the death of the King. The Jacobins were dissatisfied with him because he did not give up the whole of his immense wealth, and the baseness of his character alienated all his former supporters. On April 6, 1793, the Convention decreed the arrest of all the members of the Bourbon family, and the estates of the Orleans family were confiscated. Philippe Egalité, with his family, was thrown into prison at Marseilles, and in May was accused of high treason. He was acquitted, but in September was brought before the Revolutionary Tribunal in Paris; and on November 6, 1793, he was condemned, and by his own request was executed the same day. He faced death courageously. His son, the seventh Duke of Orleans, became King of France in 1830. See LOUIS PHILIPPE.

Louis Philippe's eldest son, FERDINAND, Duke of Orleans, was born in Palermo, September 3, 1810. In 1831-32 he served in Belgium, and in 1835-40 in Algeria, and he subsequently took a prominent part in the reorganization of the French army. While on his way from Paris to Neuilly, July 13, 1842, the horses of his carriage became unruly, and in jumping from it he fractured his skull. He was a prince of many amiable qualities, and his death was greatly deplored by the French people. He left two sons, Louis Philippe, Count de Paris (q.v.) and Robert Philippe, Duke de Chartres (q.v.). After the fall of the Empire, the Orleans Princes were permitted to return to France, whence they had been expelled in 1848, and for a time they exercised considerable influence on the politics of the day. They plotted the restoration of the July monarchy, but enjoyed little popularity owing to their close alliance with all the elements of reaction in France. In June, 1886, the Count de Paris, the Duke de Chartres, and the Duke d'Aumale were sent into exile, where the two former continued to plot with Boulanger (q.v.) for the overthrow of the Republic. The son of the Count de Paris, LOUIS PHILIPPE ROBERT, Duke of Orleans (1869—), is the Legitimist pretender to the Crown of France. Becoming

of age in 1890, he went to Paris and there offered himself for the customary military service, but was arrested under the Expulsion Bill of 1886, which prevents the direct heirs of former reigning families from residing in France. After being imprisoned for a few months, he was liberated by President Carnot, and escorted to the Swiss frontier by the French police. He afterwards lived in Brussels for a time. Between the years 1890 and 1895 he traveled in Asia. In 1896 he married an Austrian princess. He had early assumed the ducal title last used by his grandfather. He made a bid for popularity in connection with the Dreyfus affair in 1897 by upholding the army, but gained little by his interference. Until 1900 he resided in England, where he was well treated and received, but in that year he brought himself into great odium by publicly approving disgraceful caricatures of Queen Victoria, published in Paris. The other sons of King Louis Philippe were the Duke of Nemours, the Prince de Joinville, the Duke d'Aumale, and the Duke de Montpensier (qq.v.). In 1852 the Government confiscated a large part of the Orleans estate to the value of 50,000,000 francs.

Consult, in addition to the histories of France and of the different reigns and periods: Laurentin, *Histoire des ducs d'Orléans* (Paris, 1832-34); Marchal, *La famille d'Orléans, depuis son origine jusqu'à nos jours* (ib., 1845); Saint-Simon, *Mémoires;* Perkins, *France Under the Regency* (Boston, 1892); Lemontey, *Histoire de la régence* (Paris, 1832); Wiesener, *Le régent, l'abbé Dubois et les Anglais* (ib., 1891-93); Jobez, *La France sous Louis XV.*, vols. i., ii. (ib., 1864-65); Crétineau-Joly, *Histoire de Louis Philippe d'Orléans et de l'Orléanisme* (ib., 1862); Tournois, *Histoire de Louis Philippe Joseph d'Orléans et du parti d'Orléans dans ses rapports avec la révolution française* (ib., 1842-43, 1876); Ducoin, *Philippe d'Orléans Egalité* (ib., 1845-61).

ORLEANS, Charles, Duke of. A French poet. See Charles of Orleans.

ORLEANS, Hélène Louise Elisabeth, Duchess of (1814-58). She was born at Ludwigslust, daughter of the Grand Duke Frederick Louis of Mecklenburg-Schwerin. In 1837 she married the son of Louis Philippe, Prince Ferdinand of Orleans, who died in 1842. After the fall of Louis Philippe (1848) she attempted to seat her elder son, the Count of Paris, upon the throne, but was unsuccessful and had to leave France for England.

ORLEANS, Henri Philippe Marie, Prince d' (1867-1901). A French explorer, born at Ham, near Richmond, England, a son of Robert, Duke de Chartres (q.v.). In 1889-90 he accompanied Gabriel Bonvalot on a journey through Central Asia; two years later he explored Indo-China; and in 1895 discovered the sources of the Irrawaddy, an achievement for which he received the gold medal of the Société de Géographie de Paris and the cross of the Legion of Honor. In 1897 and in 1898 he visited Abyssinia, and in 1901 went to Anam, where he died. Among his writings are: *Une excursion en Indo-Chine* (1892); *Autour du Tonkin* (1894); *A Madagascar* (1895); and *Du Tonkin aux Indes* (1897).

ORLEY, ôr'lī, Bernaert, or Barend van (c.1492-1542). A Flemish painter, born at Brussels, hence also called Barend van Brussel. Probably a pupil of his father, Valentyn van Orley (1466-c.1530), he went to Rome after 1509 and became a successful imitator of Raphael, in whose school he studied. He was Court painter successively to Charles V., to Margaret of Austria, Regent of the Netherlands, and to her successor, Mary of Hungary. Van Orley stands next to Mabuse among the leaders of the tendency to 'Italianize' Flemish art. His coloring is sadly degenerate from the old Flemish masters, cool in general effect, yet gaudy, and although his early works show good composition and elevated sentiment, he afterwards lapsed into the mannered style of the later followers of Raphael. Flemish thought and practice are most observable in his "Pietà," in the Brussels Museum, which also contains the "Trials of Job" (1521), a "Holy Family," and two portraits. His most considerable work is probably the shrine with "The Trinity Worshiped by Saints," in Saint Mary's at Lübeck. Noteworthy, furthermore, are a "Holy Family," in Dresden; "Marriage of the Virgin," in the Louvre; "The Magdalen Reading," in the National Gallery, London; and "Repose in Egypt," in the Royal Institution at Liverpool. The large "Last Judgment," in the Church of Saint James, at Antwerp, is most indicative of his adopted Italian manner. Of his designs for tapestries, the best known are "The Life of Abraham," in Hampton Court, and "Maximilian's Hunt," in the Louvre. The windows with the portraits of Francis I., Charles V., and Mary of Hungary, in the Cathedral at Brussels, were also done from his cartoons. For his biography, consult Wauters (Paris, 1894).

OR'LOFF. The name of a prominent Russian family. Grigori (1734-83) was a grandson of Ivan, founder of the family. He won the love and favor of Catharine II., whom he helped put on the throne. His influence with the Empress, who bore him a son, the first Count Bobrinski, came to an end in 1772. His brother Alexei (1737-1808) also took part in the conspiracy of 1762, and with his own hands strangled Peter III., husband of Catharine II. For his victory over the Turks at Tchesme in 1770 he received the epithet Tchesmenski. He did much for the improvement of Russian horses. Alexei's nephew, named Alexei Fedorovitch (1787-1861), was a natural son of Fedor (1741-1796). He fought bravely in the wars with Napoleon, and in the Turkish campaign; was plenipotentiary at the signature of the Treaty of Adrianople (1829); and, after acting as Minister to Great Britain, negotiated the Peace of Unkiar-Skelessi in 1833. For a long time he was chief of the Russian police. In 1856 he was made prince when he was sent to Paris to represent Russia. His son, Nikolai (1827-85) was minister at Brussels (1860-70) and ambassador at Paris until 1882 and at Berlin. He wrote on the war of 1806 and urged the abolition of corporal punishment.

ORLOP (formerly also *overlope*, from Dutch *overloop*, orlop, a running over, from *over*, over + *loopen*, to run). The deck next below the berth deck in old-fashioned men-of-war. See Deck.

OR'MAZD, or **OR'MUZD** (Pers., from Phl. *Aûharmazd*, OPers. *Auramazda*, Av. *Ahura Mazda*, Lord Wisdom). In the Zoroastrian religion, the Supreme Being. In the Avesta (q.v.) he is repre-

sented as the head of the heavenly host and as sovereign over the realm of good, light, and truth. In the Old Persian Inscriptions, as well as in the Pahlavi texts and the Avesta, he is the creator of all that is good in the world. Ormazd is the guardian of mankind; he is a giver of rewards; but he may mete out punishment as well. His throne is in the heavens, in the realm of eternal light, where his presence is manifested by splendor and glory. This is the sense in which we must understand the Avesta when it alludes to Ahura Mazda's 'form.' Auramazda is represented on the sculptured rocks of Behistun as a crowned and bearded figure in a winged circle above the head of King Darius, a conception borrowed from Assyro-Babylonian art. In the Sassanian bas-reliefs, Ormazd is portrayed on horseback presenting the Imperial crown to Ardashir.

The spiritual side of Ahura Mazda is constantly dwelt upon in the Avesta. He creates through his 'Holy Spirit,' which is a 'spirit of intelligence' as contrasted with the ignorance and lack of prescience on the part of Ahriman (q.v.). In the philosophic development of Zoroastrianism this spiritual essence of Ahura Mazda is often conceived to be an emanation separate and apart from the divinity, acting in opposition to the Evil Spirit, Angra Mainyu, and yet of the same substance as Ormazd. From this transcendental Zoroastrian view it is possible to understand how the different Iranian sects early began to tend toward monotheism as opposed to the earlier dualism which made Ahriman self-existent, and coeval, though not coeternal, with Ormazd. This unifying tendency sometimes postulated Boundless Time, or Eternity, as the source alike of Ormazd and Ahriman; sometimes it is presupposed that the Holy Spirit and the Evil Spirit were the children of Ormazd, the wicked principle being due to a moment of doubt on the part of the great god. But in all cases Ormazd rises supreme as the acknowledged head and sovereign of the heavenly kingdom. Ahura Mazda is attended by a band of six (or seven) archangels, 'Immortal Holy Ones,' and also by a score or more of angels and a host of minor spirits.

In viewing the Zoroastrian conception of Ormazd we must also allow the existence of a few reminiscences of naturalistic ideas, a tinge here and there of the sky god warring against the serpent demon of the heavens. But these survivals are very slight. The same is true of the occasional Varuna of the Vedas, as an old Aryan conception of God. Ormazd as a deity stands far above both Hindu and Babylonian ideals, and approaches the Judæo-Christian conception of Jehovah.

Bibliography. Jackson, "Ormazd, or the Persian Idea of God," in *The Monist*, vol. ix. (Chicago, 1899); id., "Iranische Religion," in Geiger and Kuhn, *Grundriss der iranischen Philologie*, vol. ii. (Strassburg, 1901-03); Darmsteter, *Ormazd et Ahriman* (Paris, 1887); Stave, *Ueber den Einfluss des Parsismus auf des Judenthum* (Haarlem, 1898). See Ahriman.

ORME, ôrm, Philibert de l'. See De l'Orme, Philibert.

ORME, Robert (1728-1801). An Anglo-Indian historian. The son of Dr. Alexander Orme, physician and surgeon of the British army in Bombay, he was born at Anjengo, Travancore, India. He was educated at Harrow, England, and went back to India in 1742 as a writer in the employ of the East India Company. In 1752 he went to England in company with Captain Clive, afterwards Lord Clive, Baron of Plassey, his friend for many years. He returned again to India, and in 1754 became fourth member of the council at Fort Saint George, and rose to be a commissary and accountant-general (1757-58). He was influential in establishing the power of Great Britain in India, and active in the interest of his friend Clive, whom he succeeded in having appointed as military commander of that country. He returned to England finally in 1759, and became historiographer to the East India Company, retiring to Ealing in 1792, where he died on January 13, 1801. His works include *A History of the Military Transactions of the British Nation in Indostan* (5th ed., London, 1799); and *A General Idea of the Government and People of Indostan* (ib., 1811). Consult biographical memoir attached to his *Historical Fragments of the Mogul Empire* (2d ed., London, 1782).

OR'MEROD, Eleanor A. (1828-1901). An English naturalist and entomologist. She was born at Sedbury Park, Gloucestershire, and early devoted herself to the study of injurious insects. She was the first woman to receive a fellowship in the Meteorological Society (1878). The Royal Horticultural Society awarded her the Silver Floral Medal for her services to the science of economic entomology; and from Edinburgh University in 1900 she received the degree of LL.D. Her publications include: *Cobham Journals* (1879); *Manual of Injurious Insects* (1881); *Guide to Insect Life* (1884); and *Annual Reports of Observations on Injurious Farm Insects* (1877 et seq.).

ORMOC, ôr-môk'. A town of Leyte, Philippines, situated on the Bay of Ormoc, on the west coast of the island. It is surrounded by stone breastworks and three ruined forts, and is an important hemp port. Population, 8107.

OR'MOLU (Fr. *or moulu*, ground gold, from *or*, from Lat. *aurum*, gold, and *moulu*, p.p. of *moudre*, from Lat. *molere*, to grind). A gilded bronze, or fine brass, sometimes colored or lacquered, to give it additional brilliancy. It was used, especially during the Gothic and Renaissance periods, for mounting on furniture. It is also used for candelabra and other fine metal work.

ORMONDE, ôr'mond, James Butler, twelfth Earl and first Duke of (1610-1688). A British soldier and statesman, the first of the ancient Anglo-Irish family of Butler on whom the ducal title was conferred. He was born in London. On his father's death he became Viscount Thurles, and heir to the title. His grandfather, Walter, Earl of Ormonde, having displeased James I. and having been imprisoned, the young heir was seized as a royal ward, and placed under the guardianship of the Archbishop of Canterbury. In his twentieth year he married his cousin, Lady Elizabeth Preston, and in 1632 succeeded to the earldom and estates of Ormonde. On Strafford's recommendation Ormonde was appointed to the chief command of the army in Ireland in 1640, just before the outbreak of the great rebellion there. He repeatedly defeated

the insurgents. When, in 1643, he concluded an armistice, his policy was loudly condemned as well by the friends as by the enemies of the Royalist Party in England. During the long contest of Charles with the Parliament, Ormonde continued to uphold the royal interest in his Irish government. When the last crisis of the King's fortunes came, he resigned his Irish command, and retired to France, from which country he again returned to Ireland, with the all but desperate design of restoring the royal authority. After a gallant but unequal struggle, he was compelled, in 1650, to return once more to France. His services to the royal cause continued unremitting during his exile; and at the Restoration he accompanied Charles II. on his return, and was rewarded for his fidelity by the ducal title of Ormonde. His after life was less eventful, although he twice again returned to the government of Ireland. In 1670 occurred the well-known attempt by the notorious Colonel Blood (q.v.) upon the life of Ormonde. He escaped uninjured, and lived until the year 1688. His letters and papers were published under the title, *Original Letters and Papers Concerning the Affairs of England, 1641-60* (London, 1739). Consult Carte, *Life of the Duke of Ormonde* (last ed., Oxford, 1851).

ORMS'BY, JOHN (1829-95). An English author and traveler. He belonged to an English family that settled in Ireland in the reign of Queen Elizabeth, and he was born at the family-seat, Gortner Abbey, in the county of Mayo. After graduating B.A. from Trinity College, Dublin, he went to London, where he studied law at the Middle Temple, but he soon drifted into literature. To *Fraser's Magazine* and other periodicals he contributed many sketches of travel, some of which were collected under the title of *Autumn Rambles in North Africa* (1864) and *Stray Papers* (1876). Becoming interested in Spain and Spanish literature, he translated the *Cid* (1879) and *Don Quixote* (1885), both admirably. Consult the biographical sketch by Leslie Stephen in the *Alpine Journal* (London, 1896).

OR'MULUM, THE. An English poem written about 1200, by Orm or Ormin (a Danish word meaning 'worm'). Of the author nothing is directly known. He was probably of a Danish family dwelling in the northeastern part of the old Kingdom of Mercia, and he may have been an Augustinian monk. The poem, 'named Ormulum for that Orm it wrought,' is composed of a series of homilies (based on Ælfric, Bede, Gregory I., and Isidore), extending from the Annunciation into the Acts of the Apostles. It exists in only one manuscript (Bodleian Library), believed to be the author's own copy. The manuscript, containing more than 20,000 half lines, is, however, only a fragment, about one-eighth of the entire work as written by Orm. The poem has great linguistic value as a representative of the English a little more than a century after the Norman Conquest. Orm wrote his poem in the regular septenarius, an iambic line, divided into two sections of eight and seven syllables. A marked peculiarity of the orthography is the doubling of consonants for indicating short vowels and for other phonetic reasons. Consult the *Ormulum*, ed. by Holt (Oxford, 1878); and the bibliography of critical works on the poem in Körting's *Grundriss der Geschichte der englischen Litteratur* (Münster, 1899).

ORMUZ, ôr'mŭz, **ORMUS,** or **HORMUZ.** A small island in the entrance to the Persian Gulf, near the coast of Persia (Map: Persia, F 7). It contains the ruins of a city which in the thirteenth century was transferred hither from the mainland. It had long been the headquarters of the Persian trade with India, had a population of 40,000, and remained an important commercial centre after it was captured by the Portuguese in 1515. They retained it until 1622, when it was taken by the English and given to Shah Abbas of Persia, who destroyed the city and transferred its trade to the port of Bender Abbas on the mainland. The island still yields salt and sulphur.

ORMUZD. See OHRMAZD.

ORNAMENT (OF., Fr. *ornement*, from Lat. *ornamentum*, adornment, from *ornare*, to adorn, equip). In general, any adornment executed not for its own sake, but for that of the object or structure to which it is applied; in a narrower sense, any motive or element in a decorative scheme or pattern. Ornament has always been an important department of architectural design, because, however possible it may be theoretically to impart to buildings, by mere excellence of composition and proportion, that beauty without which they are merely works of engineering, in actual fact the arts of architecture and of industrial design have always depended chiefly for the beauty of their products upon the judicious use of ornament, and the various historic styles are most readily distinguished by the character of their ornament. Ornament has, in turn, in its historic developments followed the lead of architecture, and its styles are as clearly marked; for the decorator, however free in theory to design according to an unfettered fancy, has in all ages been dominated by the limitations of tradition, inheritance, custom, and circumstance, which have constrained him into habitual and established ways of designing.

Ornament is classified according to various categories. That which belongs to immovable structures is called *architectural* ornament; the ornament of movable structures (furniture) and objects is *industrial*. Ornament whose form is determined by structural features, or which is an inherent part of the structural framework, is called *structural* ornament; such are capitals and bases, moldings and cornices, finials and corbels. That which is added to a structure or object which has already received definite form is called *applied ornament*; such are all inlays, mosaic, painted ornament, and plaster-work. Ornament produced by relief or depression is called *plastic* or *glyptic* ornament, and includes all carved, engraved, chased, and molded ornament; while ornament by color, whether of mosaic, inlay, painting, enamel, or stained glass, is *chromatic* ornament. When the forms of ornament are purely geometric or fanciful, they are said to be *conventional*, as in Moorish and Saracenic decoration; when copied more or less closely from animal or vegetable forms, they are *naturalistic*; when natural forms are subjected to a decorative regularization, they constitute *conventionalized natural* ornament; such are the acanthus-leaves of the Corinthian capital and the foliage of early Gothic carving. *Grotesques* are deco-

rative combinations of heterogeneous natural forms, as in griffins, sphinxes, Gothic gargoyles, and the like.

Apparently all primitive and savage ornament and most ancient Oriental ornament was originally magical or fetishistic (see FETISHISM), and the artificial symbolism of classic and modern ornament is a survival of this primitive magical significance. Conventional ornament has arisen partly from the gradual 'decay' of originally symbolic forms, partly from the manipulations of pottery, basketry, weaving, and metal work. Structural ornament, which the Greeks were the first to develop into importance, has always derived many of its forms from obsolete structural processes—as the triglyph and dentil from obsolete systems of wooden construction. Structural ornament was carried to the highest perfection by the mediæval church-builders, who developed an entirely new system of decorative structural forms in working out the problem of a three-aisled vaulted structure of stone (see GOTHIC ARCHITECTURE); clustered shafts, capitals, vaulting-ribs, pinnacles, tracery, etc., were at once structural necessities and decorative embellishments; and all the minor details grew up as the result of this structural development. The Roman system, revived in the Renaissance and almost universally followed to-day, was to erect a structure of coarse materials and then clothe it in a decorative garment of marble incrustation, stucco, and applied ornament; and the Byzantines and the Mohammedan nations developed the use of applied color, by means of mosaic, stucco, tiles, etc., in different directions to a wonderful pitch of splendor. Ornament has in different lands and periods received notable developments outside of architecture, as in the textile arts, in pottery, china, and porcelain; in goldsmith's work and enamel; in furniture, in manuscript illumination, typography, and bookbinding. The Western nations have excelled, as a rule, in form; the Eastern nations in color. Chinese and Japanese art has never been surpassed in its handling of color ornament in porcelains and earthenwares, and it also excels in minute carvings in ivory and castings in bronze.

BIBLIOGRAPHY. Owen Jones, *Grammar of Ornament* (London, 1856); Racinet, *L'ornement polychrome* (Paris, 1885-87); Viollet-le-Duc, *De la décoration appliquée aux édifices* (ib., 1894); Wornum, *Analysis of Ornament* (London, 1874); Haddon, *Evolution in Art* (ib., 1895); Ward, *Elementary Principles of Ornament* (ib., 1890), and *Historic Ornament* (ib., 1897); and Hamlin, "The Evolution of Decorative Motives," in the *American Architect* for 1898-1901.

ORNAMENTS RUBRIC, THE. A rubric in the English Prayer-Book on the interpretation of which much of the ritual controversy has turned. It precedes the Order for Morning Prayer, and runs as follows: "And here it is to be noted that such ornaments of the Church and of the ministers thereof, at all times of their ministration, shall be retained and be in use as were in this Church of England, by the authority of Parliament, in the second year of the reign of King Edward the Sixth." By 'ornaments' are understood, according to an official decision of the Judicial Committee of the Privy Council, 'all articles used in divine service.' The rubric is simply a more emphatic form of that inserted in 1559 and again in 1604. It was deliberately retained in 1661, in spite of the opposition of the Puritans, and has held its present place since the final revision in 1662. Its interpretation rests upon the question whether it refers to the status of things under the first Prayer Book of Edward or to that immediately anterior to its issue, in the partially reformed services of 1548. The traditional view refers the words of the rubric to the first Prayer-Book. But this was not actually in use by authority of Parliament until the third year of Edward's reign. On the other hand, the wording, on the face of it, points to a certain year—the year before the introduction of the Prayer-Book. The difficulty of deciding between these views is increased by a clause in the Elizabethan Act of Uniformity. This provided for the retention of the ornaments "until other order be taken by the authority of the Queen's majesty with the advice of the Ecclesiastical Commissioners or of the Metropolitan of this realm," and the question arises whether further order was formally taken or not. There appears to have been little or no effort to enforce the observance of the rubric in Elizabeth's day. The times were troublous, and in some influential quarters there was no intention of using the ornaments. If 'other order' was taken it may have been through the 'Advertisements' (see ADVERTISEMENTS OF ELIZABETH) in 1566. But whether these could override the Elizabethan act or not is a very intricate historical point. Consult Parker, *The Ornaments Rubric* (Oxford, 1881); and see RITUALISM.

ORNE, ôrn. A department of France, formed of part of Normandy and bounded on the north by the Department of Calvados (Map: France, F 3). Area, 2372 square miles, more than one-half of which is cultivated land. A range of wooded hills, attaining a maximum altitude of 1370 feet, extends across the south of the department from east to west. North of this range the surface slopes toward the English Channel. The principal river is the Orne, which gives its name to the department. The climate is damp, though in general temperate. The soil is fertile, but agriculture is not in an advanced state; the chief crops are wheat, oats, and barley. There are several millions of apple and pear trees in the department, and cider is extensively made. Cattle, and horses of the purest Norman breed, are reared. Marble, granite, and other stones for building are quarried; and there are manufactures of textiles and pins. Capital, Alençon. Population, in 1896, 339,162; in 1901, 325,441.

ORNITHODELPHIA (Neo-Lat., from Gk. *ὄρνις, ornis*, bird + *δελφύς, delphys*, womb). A subclass of the Mammalia, the Prototheria (q.v.), distinguished by the bird-like arrangement of the reproductive organs. Compare DIDELPHIA; MONODELPHIA.

ORNITHOLOGISTS' UNION, AMERICAN. A society founded in New York in 1883, and incorporated under the laws of the District of Columbia in 1888, for the advancement of its members in ornithological science and for the publication of a journal of ornithology and other works relating to that science. The Union publishes *The Auk*, a quarterly journal of ornithology, the *American Ornithologists' Union Check-List of North American Birds*, and the *Code of Nomen-*

clature. The *Check-List* is a standard, and many of the principles of nomenclature adopted by the Union in 1885 are now used in other branches of zoological science. The membership of the Union consists of fellows, honorary fellows, corresponding fellows, members, associates, and patrons.

ORNITHOL'OGY (from Gk. ὄρνις, *ornis*, bird + λογία, *logia*, account, from λέγειν, *legein*, to say). The science of bird study. The word was first used, so far as is known, in 1670, in Blount's *Glossographia*, where it is mentioned as the title of a late book. The Hebrew scriptures (Jer. viii. 7, and Song of Solomon ii. 12) show that the Hebrew sages had noted the phenomena of the spring migration, and we are told that Solomon "spake also of beasts, and of fowl, and of creeping things, and of fishes." But hundreds of years before Solomon, Egyptian artists were noting birds and drawing and coloring their portraits so well that we may recognize species.

In the writings of Aristotle we find mention of about 170 species of bird, but only about four-fifths can be identified. Pliny the Elder devoted one volume of his writings to birds, much of the information in which was evidently taken from Aristotle, but after him down to the latter part of the seventeenth century there is hardly a work on birds that is anything more than an entertaining compilation of absurdities. The *Historia Animalium* of Gesner, published at Zurich (1551-58), and the *Historia Naturalium* of Aldrovandi, published at Bologna after his death in 1605, are characteristic of the superstitions and utterly unscientific trash which passed for natural history in those days. In 1676 there appeared in Latin Ray and Willughby's *Ornithologia*, and two years later an English revised edition. This book was really a foundation for modern ornithology. It divided birds into the two groups land-birds and water-birds, and the latter group was again divided into swimmers and those which frequent watery places. For 200 years these divisions were made use of by ornithologists, and it is only within very recent years that they have been discarded. In 1735 appeared the first edition of Linnæus's epoch-making work *Systema Naturæ*, in which chaos was reduced to order and the binomial system of nomenclature was propounded and used. The twelfth edition (1766) is the basis of modern systematic zoölogy. Linnæus followed quite closely the general classification of Ray. Following Linnæus are a long list of ornithologists, one of whom was M. J. Brisson, whose six-volume *Ornithologia* was one of the best works on birds published during the eighteenth century. As a descriptive ornithologist he is ranked among the best. Another Frenchman of note was Buffon, whose nine-volume *Histoire naturelle des oiseaux* is an extraordinary piece of work, especially when considered from a literary point of view. Then there is Latham, whose *General Synopsis of Birds* was completed in 1785, but afterwards appeared in several revised editions. The compilation by Gmelin in 1788 of a thirteenth edition of Linnæus's *Systema* was most important, but the rarity of the original has caused some confusion as to what is Linnæus's and what Gmelin's work. The next writer of importance is Cuvier, whose *Règne animal* of 1817 revolutionized zoölogical classification. Cuvier made use almost exclusively of external characters, particularly of the bill and feet. He grouped birds in six orders—Accipitres, Passeres, Scansores, Gallinæ, Grallatores, Natatores. This classification has been the foundation of the classification of birds adopted in natural histories, and even in many zoölogies, down to the present day. The advantages of this classification are clear, for the number of orders is small and they are based on obvious external differences. In addition to this, Cuvier's great reputation as a zoölogist gave weight to his views, and consequently the Cuvierian system has continued almost unbroken, the only very radical change being the recognition of the differences between the Carinatæ and Ratitæ, and the separation of the latter from the Grallatores.

With the opening of the nineteenth century there came a great increase in the number of bird students and the publication of ornithological literature. American ornithology has been wholly a growth of the past century. In England the publication of Gilbert White's *Natural History of Selborne* in 1789 did more to stimulate popular interest in ornithology than any other book ever has done. It has passed through more editions, by far, than any other work on natural history. Bewick's *History of British Birds* first appeared in two volumes, in 1797 and 1804. The next works of note are the magnificent monographs by John Gould (q.v.)—*Birds of Europe* (5 vols., 1832-37); *Rhamphastidæ* (1834); *Trogonidæ* (1838); *Birds of Australia* (7 vols., 1848); *Trochilidæ* (5 vols., 1849-61); *Odontophorinæ* (1850); *Birds of Asia* (7 vols., 1850-53); and *Birds of New Guinea* (1875-81). We mention all of these because of their wealth of illustration, which consists of more than 3000 colored plates. The works of Illiger, Vieillot, and Temminck appeared between 1810 and 1820, and all three were important leaders in the systematic zoölogy of their day. The works of C. L. Nitzsch deserve special mention because of his being the founder of the study of pterylosis (q.v.) by his *System der Pterylographie*.

Turning now to America, the first ornithologist of any reputation was William Bartram, who published in 1791 his *Travels Through North and South Carolina*, which has been called 'the starting point of American ornithology.' In 1808 appeared the first volume of Alexander Wilson's *American Ornithology*, the last two volumes of which were published in 1814 by Ord, Wilson's friend and editor. Wilson was one of our most remarkable ornithologists, and his great work contains an account of about 280 species of birds, which were not only faithfully described, but carefully figured in colors. Several editions of this classic have been published. After Wilson's death, his work was continued by Charles Lucien Bonaparte, who published in the years 1825-33 his four large volumes, uniform with Wilson's *Ornithology*. In 1831 appeared the bird volume of Richardson and Swainson's *Fauna Boreali-Americana*, a book of the greatest importance. The *Manual of Ornithology of the United States and Canada*, by Thomas Nuttall, appeared in 1832-34, and is a well-written and interesting treatise. The Audubon period followed, in which appeared that most magnificent of bird-books, the original folio edition of Audubon's *Birds of America*. Altogether there were 435 plates with more than 1000 figures. The text to accompany

this set of plates consisted of five volumes called *Ornithological Biography*, and is intensely interesting reading. These were not by any means the only books which Audubon (q.v.) wrote, but it is on these that his fame rests most securely. There can be no question, however, that much of Audubon's success was due to his keen Scotch friend William MacGillivray, who was an adept at avian anatomy.

The Audubonian period may be said to have passed into the Bairdian in the fifties; especially on the publication in 1858 of Vol. ix. of the Pacific Railroad Reports, devoted to the birds secured by the various parties making surveys for the proposed transcontinental railroad. In this volume Spencer F. Baird came to the front as an ornithologist, for although he was materially assisted by Cassin and Lawrence, the work was primarily his. It has well been said that this book "effected a revolution in classification and nomenclature," for the names used both for groups and species were a radical departure from those current in the Audubonian period. Baird was the leading American ornithologist of the third quarter of the nineteenth century, and his influence remains strong.

Since 1870 ornithology has progressed marvelously, and among those who advanced it Elliott Coues may be placed foremost because he first made really accessible to American students a knowledge of the bird fauna of their own country. Adding to his very extensive acquaintance with birds a wide knowledge of ornithological literature and history, and a charming literary style, he made his *Key to North American Birds* highly influential, and, at the period of its first publication (Boston, 1872), an indispensable guide to every bird-student. Revised editions were issued successively in 1884, 1887, 1890, and 1903. Dr. Coues was the author of numerous other books and papers, of which *Birds of the Northwest* (1874), and *Birds of the Colorado Valley*, part i. (1878), were most important. The critical bibliography begun in the later work and continued elsewhere constitutes a history of the development of American ornithology.

The names of Robert Ridgway and J. A. Allen belong, with that of Coues, in the front rank of American ornithologists of their period. The former spent his life in the service of the Smithsonian Institution, and was co-author with S. F. Baird and T. M. Brewer in the important *History of North American Birds*, of which the first three volumes (land birds) were issued in Boston in 1874, and the last two (water birds) in 1884. Besides many technical and faunal papers, he published a *Manual of North American Birds* (Philadelphia, 1887), which embodied the ideas and classification that prevailed at the National Museum. A second edition soon followed. In 1901 appeared the first part (Fringillidæ) of a most comprehensive treatise entitled *The Birds of North and Middle America*, written by Ridgway and published by the Smithsonian Institution as *Bulletin No. 50* of the United States National Museum. This work is purely technical, containing no account of the habits of the birds, but as a guide to American ornithology it is the most advanced and complete treatise of its time. The second part appeared in 1902 and others followed at intervals.

Dr. J. A. Allen (q.v.) contributed greatly to the philosophy of ornithology, and as editor of *The Auk* for many years exerted a constant and critical scientific influence. The latter part of his life was spent as curator of the department of birds in the American Museum of Natural History at New York, where his assistant was Frank M. Chapman, whose numerous books, especially his practical *Handbook*, vastly stimulated the growth of the popular interest and knowledge of birds which was so striking a feature of the intellectual development of the country toward the close of the nineteenth century. Since 1883 the controlling factor in the progress of the science of ornithology in America has been the American Ornithologists' Union (q.v.).

Cuvier's scheme of classification held its ground in popular books, with very little change, during the entire century. Since 1860, however, ornithologists have recognized that, however 'convenient' Cuvier's system may be, it is woefully unnatural, and many and varied have been the attempts to produce a 'natural' classification. Of these we can only mention the most important. In 1867 Huxley published his celebrated *Classification of Birds*, based very largely upon skeletal characters, especially those connected with the skull. His classification may be briefly summarized as follows:

Division A. Metacarpals not ankylosed together; tail longer than body; order SAURURÆ.

Division B. Metacarpals ankylosed; tail considerably shorter than body:

(*a*) Sternum devoid of a keel; order RATITÆ.

(*b*) Sternum provided with a keel; order CARINATÆ.

Order SAURURÆ. Archæopteryx only.

Order RATITÆ:

(*A*) Humerus short; 1 ungual phalanx.

(*a*) With a hallux, kiwis (Apteryx).

(*b*) No hallux; moas, cassowaries.

(*B*) Humerus long; 2 ungual phalanges.

(*a*) Ischia united beneath sacrum; pubes free; rheas.

(*b*) Ischia free; pubes united ventrally; ostriches.

Order CARINATÆ:

(*A*) Vomer broad behind and interposing between the pterygoids, the palatines, and the basi-sphenoidal rostrum; *Dromæognatha* (tinamous).

(*B*) Vomer narrow behind; pterygoids and palatines articulating largely with basi-sphenoidal rostrum.

(*a*) Maxillopalatines free.

(1) Vomer pointed in front; *Schizognatha*. (Plovers, shore-birds, gulls, penguins, cranes, hemipodes, fowls, sand-grouse, pigeons, hoactzin.)

(2) Vomer truncated in front; *Egithognatha*. (Passerines, swifts, woodpeckers.)

(*b*) Maxillopalatines united; *Desmognatha*. (Birds of prey, parrots, cuckoos, kingfishers, trogons, ducks, geese, flamingoes, storks, cormorants.)

This classification was the first important contribution to ornithology after the publication of the *Origin of Species*, and it is really the basis of later systems. The work of Garrod and Forbes on avian anatomy led to many changes in the relative position of certain birds and

groups [illegible] increased immensely our store of facts, [illegible] the systems which they proposed have never met with any general acceptance. Sclater's system, proposed in 1880, included some 26 orders, and has for that reason alone failed to meet any wide acceptance. The same criticism applies to his successors, and the complexity of the systems proposed by Reichenow, Stejneger, Fürbringer, Sharpe, and Gadow has militated against their general use. Indeed, it is a rather notable fact that no system that has yet been proposed has proved satisfactory. A very full history of the taxonomy of ornithology may be read in the 'Introduction' of Newton's *Dictionary of Birds* (New York, 1896).

The very latest scheme of arrangement having the sanction of authority is that adopted by Evans and the editors of the *Cambridge Natural History* in vol. ix. of that work, "Birds" (London, 1901). It divides all birds, fossil and recent, into sub-class I., Archæornithes (Archæopteryx alone) and sub-class II., Neornithes (all the remainder). The Neornithes are divided into – A, *Ratitæ*, birds with a keelless sternum; B, *Odontolcæ*, ratite birds, with teeth in the mandibles, set in grooves; and C, *Carinatæ*, birds with keeled sternums. This last sub-class is considered divisible into 14 groups, as follows: Ichthyornithes (Ichthyornis); Colymbiformes (loons and grebes); Sphenisciformes (penguins); Procellariiformes (petrels); Ciconiiformes (cormorants, etc., pelicans, herons, ibises, flamingoes); Anseriformes (ducks, geese, swans); Falconiformes (falcons, vultures); Tinamiformes (tinamous); Galliformes (game-birds, fowls, pheasants, hoactzin); Gruiformes (rails, cranes, bustards, sun bitterns, etc.); Charadriiformes (shore-birds, coursers, thick-knees, gulls, auks, sand-grouse, pigeons); Cuculiformes (cuckoos, parrots); Coraciiformes (rollers, motmots, kingfishers, hornbills, hoopoes, owls, nightjars, swifts, humming-birds, trogons, orioles, puff-birds, toucans, woodpeckers, and related forms); Passeriformes (passerine birds). The last immensely numerous group (see Passeres) is subdivided by Evans as follows:

Passeres Anisomyodæ.
- Subclamatores (Eurylæmidæ).
- Clamatores (pittas, tyrant fly-catchers, cotingas, tree-creepers, etc.).

Passeres Diacromyodæ.
- Suboscines (lyre-bird, Atrichornis).
- Oscines (singing birds generally, from larks up to finches).

The classification of birds, as of other groups of animals, adopted for the purposes of this Encyclopædia (see Classification of Animals), is that given in Parker & Haswell's *Text Book of Zoölogy* (London and New York, 1897), and is in outline as follows:

Class Aves.

Sub-class I. Archæornithes.

Extinct, long-tailed, toothed birds. Includes only Archæopteryx (q.v.).

Sub-class II. Neornithes.

Birds in which the greatly shortened tail usually ends in a pygostyle (see Neornithes); metacarpals fused with distal carpals.

Division A. Ratitæ.—Sternum without a keel; flightless birds.

Order 1. Megistanes (emeus, cassowaries, kiwis, and moas).

Order 2. Rheæ (Rheas).

Order 3. Struthiones (Ostriches).

Order 4. Æpyornithes (Æpyornis; extinct).

Order 5. Gastornithes (Gastornis and allied Eocene genera).

Division B. Carinatæ.—Sternum with a keel; flying birds.

Order 1. Stereornithes (Phororhacos and allied Eocene genera).

Order 2. Odontolcæ (Hesperornis and allied Cretaceous genera).

Order 3. Ichthyornithes (Ichthyornis, Apatornis and allies of the Eocene).

Order 4. Pygopodes (loons and grebes).

Order 5. Impennes (penguins).

Order 6. Tubinares (petrels, albatrosses, etc.).

Order 7. Steganopodes (cormorants, frigate-birds, pelicans, etc.).

Order 8. Herodiones (herons, ibises, etc.).

Order 9. Anseres (ducks, swans, screamers).

Order 10. Accipitres (vultures, falcons, secretary bird).

Order 11. Crypturi (tinamous).

Order 12. Gallinæ (fowls, game-birds, curassows, pheasants, and hoactzin).

Order 13. Grallæ (rails, cranes, bustards, etc.).

Order 14. Gaviæ (gulls, terns, and auks).

Order 15. Limicolæ (shore-birds, curlews, jaçanas, etc.).

Order 16. Pterocletes (sand-grouse).

Order 17. Columbæ (pigeons, dodo, etc.).

Order 18. Psittaci (parrots, cockatoos, etc.).

Order 19. Striges (owls).

Order 20. Picariæ (cuckoos, rollers, kingfishers, bee-eaters, hoopoes, nightjars, swifts, humming-birds, woodpeckers, hornbills, and allies).

Order 21. Passeres (lyre-birds and song-birds generally).

See Bird, and bibliography there given.

OR'NITHOPH'ILOUS PLANTS (from Gk. *ὄρνις*, *ornis*, bird + *φίλος*, *philos*, loving). Plants pollinated by means of birds, especially humming-birds. In Africa and some other parts of the world many species are so pollinated, but in most regions only a small number are fertilized in this way. The term is being replaced by bird-pollinated. See Pollination.

ORNITHOPODA. See Dinosauria.

ORNITHORHYNCHUS, ORNITHORHYNCHIDÆ. See Duckbill.

OR'NITHOSAU'RIA (Neo-Lat. nom. pl., from Gk. *ὄρνις*, *ornis*, bird + *σαῦρος*, *sauros*, lizard), or Pterosauria. An order of extinct flying lizards in which the bones are hollow, the fore limbs admirably developed as wings, and the head more or less bird-like in form. They appeared in Jurassic time and continued to the end of the Cretaceous. Among the members of the group are the greatest flying creatures known to have ever lived. The genera are Dimorphodon, Ornitho-stoma, Pteranodon, and Rhamphorhynchus. The principal types of this order are described in the article on Pterodactyl.

OR'NITHOS'TOMA (Neo-Lat., from Gk. *ὄρνις*, *ornis*, bird + *στόμα*, *stoma*, mouth). The greatest known flying creature that has ever lived, a winged reptile, found in the Cretaceous rocks of Kansas.

OR'OBUS (Neo-Lat., from Gk. *ὄροβος*, *orobos*, Lat. *ervum*, OHG. *araweiz*, *arwiz*, Ger. *Erbse*, vetch). A name formerly applied to a genus of plants of

the natural order Leguminosæ, allied to vetches, and sometimes called bitter vetch, but now merged with Lathyrus (q.v.). The species are perennial, chiefly natives of Europe. They afford good food for cattle. *Lathyrus montanus*, a European species, with racemes of purple flowers, is especially common in hilly districts. The stem is unbranched, erect, about a foot high, with narrow membranous wings, the root swelling out at irregular intervals into sweet liquorice-flavored tubers, which are boiled or roasted in Holland, Belgium, Scotland, and other countries.

OROCHONES, ō'rō-chō'nēz. A people of the eastern Amur in Asia, of the Tungus type. The term Orochon is said to be applied by the Manchus to the Tunguses in general.

OR'ODUS (Neo-Lat., from Gk. ὄρος, *oros*, mountain + ὀδούς, *odous*, tooth). Fossil shark teeth of Carboniferous age.

OR'OHIP'PUS (Neo-Lat., from Gk. ὄρος, *oros*, mountain + ἵππος, *hippos*, horse). An ancestor of the horse in the Middle Eocene period. See HORSE, FOSSIL.

O'ROIDE, or **O'REIDE** (from Fr. *or*, from Lat. *aurum*, gold + Gk. εἶδος, *eidos*, form). A variety of brass originally invented in France as a substitute for ormolu, and resembling gold. The substances used in making it are: Copper, 100 parts; tin or zinc, 17 parts; magnesia, 6 parts; ammonium chloride, 3.6 parts; lime, 1.8 parts; and crude argol, 9 parts. The copper is melted, then the magnesia, ammonium chloride, lime, and argol are added, little by little, and briskly stirred for about half an hour. The tin or zinc is added lastly in small quantities at a time until all is fused. The crucible is then covered and fusion is maintained for half an hour, when the dross is skimmed off, and after cooling the alloy is ready for use. Oroide has a fine grain, is malleable, and is capable of being brilliantly polished. It finds extensive use as a substitute for gold in the manufacture of cheap jewelry.

OROMA, ō-rō'mä. An African people. See GALLAS.

O'RONO. A town in Penobscot County, Maine, 8 miles northeast of Bangor, on the Penobscot River, and on the Maine Central Railroad (Map: Maine, F 6). It is the seat of the University of Maine (q.v.) and State Experiment Station, and has manufactures of lumber, pulp, and paper. Settled in 1774, Orono was incorporated first in 1806. The government is administered by town meetings. Population, in 1890, 2790; in 1900, 3257.

ORONTES, ō-rōn'tēz (Lat., from Gk. Ὀρόντης). The ancient name of a river in Syria, now called Nahr-el-Asi. It rises in the Lebanon Mountains and flows northward as far as the city of Antioch, and then westward to the Mediterranean Sea (Map: Turkey in Asia, F 4). Its length is about 250 miles. Its lower course is remarkably beautiful, with high rocky banks crowned with luxuriant foliage. Near its source stands an ancient monument.

ORONTIUS FINEUS, ō-rōn'-shi-ŭs fī-nē'ŭs (1494-1555). A French mathematician (named Oronce Fine, or Finé), born at Briançon. He was called the 'restorer of mathematical science' in France. A chair of mathematics was created for him in 1532 at the Collège de France. Here he wrote his most famous work, entitled *Protomathesis* (1532), consisting of four books on arithmetic, two on geometry, five on cosmography, and four on gnomonics.

OROOMIAH, ō'rōō-mē'ä. A town and lake in Persia. See URUMIAH.

O'ROONO'KO, OR THE ROYAL SLAVE, THE HISTORY OF. A novel by Mrs. Aphra Behn, about 1660. The hero was an African prince, a slave in Surinam, where the author knew him in her childhood. He was sold because of his marriage to Imoinda, a favorite of the King, but found her again a slave in the same colony. Oroonoko led an unsuccessful rising of the blacks, killed his wife, and was barbarously murdered by the colonists. A tragedy by Thomas Southerne, based on this novel, was performed in 1696.

ORO'PUS (Lat., from Gk. Ὠρωπός, *Ōrōpos*). A town in Northwestern Attica, on the border of Bœotia, celebrated for its temple and oracle of Amphiaraus. Its situation led to constant strife between the Thebans and the Athenians for its possession. The former held it B.C. 412-383 and 366-338. Subsequently the town seems to have been for a long time independent or reckoned in the Bœotian confederation. It had been restored to the Athenians before the second century A.D., for the traveler Pausanias includes it in Attica. The town lay on the seacoast in a little plain, but the temple of Amphiaraus was about four miles inland, in one of the beautiful wooded valleys which abound in this region, on a terrace above a little stream. It was excavated by the Greek Archæological Society in 1884-87. It contained a temple and altar, a colonnade, and small theatre, and we hear also of baths for men and women, and other buildings for the sick, who came to consult the god, but of these no certain remains have been found. Many inscriptions show the popularity of the place and throw light on the organization and ritual. It was a resort of the sick, for Amphiaraus was a god of healing, and, like Æsculapius, prescribed for his worshipers through dreams. He was also a seer and might be consulted on other affairs. The inquirer, after paying a fee and offering sacrifice, slept in the temple, and his dreams contained the answer to his question. The fame of the shrine was such that Sulla granted the dwellers on the territory of the god exemption from taxation, and his action was later (B.C. 73) confirmed by the Senate after a hearing by the consuls. See Preller, "Ueber Oropos und das Amphiareion," in *Berichte der sächsischen Gesellschaft der Wissenschaften* (Leipzig, 1852); Frazer, *Pausanias*, vol. ii. (London, 1898); Dürrbach, *De Oropo et Amphiarai Sacro* (Paris, 1890). The excavations are described and the inscriptions published in the *Praktika* of the Greek Archæological Society for 1884, 1887, 1890, and the *Ephēmeris Archaiologikē* (Athens, 1884-92).

OROSHAZA, ō'rōsh-hä-zō. A market town of Hungary, in the County of Békés, 33 miles northeast of Szegedin (Map: Hungary, G 5). The chief occupations are cattle-raising and viticulture. Population, in 1890, 20,000; in 1900, 21,385, mostly Magyars.

ORO'SIUS, PAULUS. A Spanish cleric and historian. He was born at Tarragona, in the latter part of the fourth century. He went to Africa in 415 to get the advice of Augustine at Hippo as to the suppression of heresy in

Spain, and thence, on Augustine's advice, to Palestine to consult Jerome, then living at Bethlehem. He went back to Africa in 416, and is heard from in 417, but the date and place of his death are unknown. His chief work, the *Adversus Paganos Historiarum Libri VII.*, was intended to refute the current notion that the misfortunes of the Roman Empire and the wretchedness of the masses were due to the anger of the gods at the abandonment of their worship and the profanation of their altars. The work is a trivial, inaccurate, uncritical miscellany of facts, yet it has obtained a place in literature from being a favorite text-book of universal history during the Middle Ages, and was translated into Anglo-Saxon by Alfred the Great (Eng. translation by Bosworth, London, 1858; also edited by Sweet, ib., 1883). Some manuscripts bear the title of *Hormesta* or *Ormista*, conjectured by some to be a corruption of Or. m. ista., i.e. *Orosii Mundi Historia* (Orosius's History of the World). The *editio princeps* of the work is Augsburg, 1471. Other works are attributed to Orosius. Those with best reason are *Liber Apologeticus de Arbitrii Libertate*, and the *Commonitorium de Errore Priscillianistarum et Origenistarum*, an explanation of religious affairs in Spain addressed to Augustine. These three works are reprinted in Migne, *Pat. Lat.*, xxxi., but the best critical editions are, of the *Historia* and *Liber Apologeticus* by Zangemeister (Vienna, 1882); of the former alone, id. (Leipzig, 1889); of the *Commonitorium* by Scheps in his edition of Priscillian (Vienna, 1889).

OROTAVA, ō'rō-tä'vä. A town near the north coast of Teneriffe, one of the Canary Islands. It is picturesquely situated at the foot of a peak, in a remarkably fertile and healthful region. It has a beautiful church and a botanical garden. Its harbor is an open roadstead. It nevertheless exports considerable quantities of wine and cochineal. Population, in 1900, 9002.

OROZCO Y BERRA, ō-rōs'kō ē bĕr'rä, Manuel (1816-81). A Mexican historian and archæologist. He was born in the City of Mexico; studied engineering and law; and in 1852 became director of archives. He suffered a short imprisonment under Juarez for accepting office from Maximilian. Journalism was his first step in literature, and in 1846 he had become editor of *El Parvenir*. He contributed to Andrade's *Diccionario universal de historia y geografia mexicana*, and wrote: *Noticia de la conjuración del Mariscal del valle* (1853); *Geografia de las lenguas y carta etnográfica de México* (1864); and *Historia antigua de Mexico* (1880-81).

ORPHAN, The. A play by Thomas Otway (1680), in blank verse, based upon the love of two brothers for Monimia, the orphan ward of their father. It is a cruel tragedy, as gloomy as anything of Ford's, and the horror is even deepened by the occasional contrast of a lighter strain.

ORPHANS' COURT. See Surrogate.

ORPHEUS, ôr'fūs (Lat., from Gk. *Ὀρφεύς*, of uncertain origin; possibly connected with the Skt. *Rbhus*, divine artists in the Vedas, or, perhaps with greater probability, with Gk. *ὀρφ-*, *orph-*, dark). A Greek legendary musician, whose prominence is largely due to his connection with a body of religious teaching. According to the common literary tradition, he was a Thracian, son of Œagros and Calliope or Polyhymnia, though some late writers name Apollo as his father. To him was attributed by some the invention of the lyre or of the cithara, while others held that these were given him by Apollo. Proverbial was the power of his music, which drew to him wild beasts, birds, and even fishes, calmed the winds and storms, stilled the raging of the sea, and turned back the course of rivers. His song also plays an important part in the stories connected with the voyage of the Argonauts, where he appears as priest and seer. Most famous, however, was his journey to the lower world to recover his wife, Eurydice, a legend which seems to have received its full development only in the late Alexandrian time. (See Eurydice.) According to one version, Orpheus killed himself in his grief at the second loss of Eurydice; others said he was smitten by the thunderbolt of Zeus because his music by its magic power was breaking down the laws of nature. The most common version was that he was torn in pieces by the Thracian women, in their orgiastic worship of Dionysus. His members were flung into the sea, whence they were collected by Calliope and the Muses for burial amid the lamentations of all nature and the now remorseful women. Only the head floated across the sea to Lesbos, where it gave oracular responses from the cleft in which it lodged. The wonderful lyre was placed among the stars by Zeus, or inherited by Musæus, or dedicated in a temple of Apollo. Orpheus himself in the other world delighted the shades with his song.

There seem to be no representations of Orpheus in ancient art before the red-figured Attic vases of the earlier fifth century, where he appears simply as a singer among the Thracians, or as murdered by the women. From that time, however, the representations become more frequent, though they are most numerous in the later Hellenistic and Roman periods. Among the scenes represented, two are especial favorites in the later art: (1) The rescue or loss of Eurydice, as in the beautiful Attic relief of which the best example is in Naples, and others in Rome and Paris, and (2) Orpheus playing on his lyre, surrounded by the wild beasts, of which several examples occur among the Pompeian paintings, while for some reason not yet satisfactorily stated it was a favorite theme in early Christian art.

The importance of Orpheus was largely due to the mass of religious literature which was attributed to him from the sixth century B.C. The origin and exact nature of these writings and the character of the Orphic sects are among the most intricate and perplexing questions in the history of Greek religious thought, nor is there any general agreement among scholars as to the detailed answers. It seems clear that, amid the general unrest which characterized Greek thought during the sixth century, leading to the speculations of the Ionian physicists and other early philosophers, to the practical maxims of the Seven Wise Men, and other manifestations of distrust as to the earlier beliefs, there sprang up teachers who professed to be able to purify the soul from the sins of this life, and secure it happiness in the world to come. Among the doctrines and rites for securing this happiness, those taught in poems attributed to Orpheus seem to

have enjoyed the widest popularity and to have influenced largely the thought and life of the time, furnishing more than mere suggestions to Pythagoras and Xenophanes. The votaries submitted to purification by various rites, including the sprinkling with blood, and were required to govern their lives by strict rules, which included abstinence from all animal food and beans, and forbade the wearing of any garment containing wool. Those who were initiated and followed the precepts of the master might hope to escape the horrors of Tartarus, and enjoy the bliss of the righteous, as described in a poem which narrated fully the journey of Orpheus to the other world, and the revelations there received by him. Gold plates containing verses from this poem have been found in graves in Lower Italy, obviously buried with believers to guide them in their journey to the world beyond. It is not clear that there was a large and organized Orphic sect. Rather the teachings and especially the rites seem to have been in the hands of wandering priests, many of whom possessed a very doubtful reputation among the thoughtful, who regarded them as impostors greedy only for gain. On the other hand, there can be little doubt that, according to the common practice among the Greeks, the believers in these teachings formed religious societies. There seems no satisfactory evidence that Orpheus was regarded as a god by these people, for their worship centred around Dionysus, and their beliefs and practices were based on a system which seems to have been set forth in a *Theogony*, attributed to Orpheus, and of which many fragmentary citations have been preserved. It is in part an effort to combine the Bacchic worship of Dionysus, the omnipresent god, with the Greek conception of the supremacy of Zeus. In the beginning were Chaos, Cronos (Time), and Æther. From Chaos and Æther Cronos produced a silver egg, from which came Phanes, the creator of all things, who is also Dionysus. After he had produced the heaven and earth and all things thereon, he retired from sight, but after the world of the gods had grown up Zeus swallowed Phanes, and thus this Dionysus became wholly a part of Zeus. The son of Zeus and Persephone was Dionysus Zagreus, who was to succeed his father, but who was enticed away by the hostile Titans, torn in pieces, roasted and eaten. The heart alone was rescued and brought by Athena to Zeus, who placed it in the third Dionysus, son of Semele. He also consumed the Titans with his thunderbolt, and scattered the ashes through the world, which thus became pervaded by Dionysus. The soul is immortal, and at death passes to Hades to be punished or rewarded, and then after a time to be reborn in animal or man, according as its former life has been evil or good. Through initiation and pure living the soul may safely pass the perils of the lower world and the judgment, and when it has three times been acquitted of all guilt, it is freed from the round of rebirths and passes to the Islands of the Blessed.

Of the large mass of literature which passed under the name of Orpheus, only a small collection of late pieces has survived, the so-called *Orphica*, including the *Argonautica*, a short hexameter poem of 1384 verses, on the voyage of the Argo, with special reference to the deeds of Orpheus; the *Lithica*, in 768 verses, containing a discourse of Orpheus on the wondrous properties of stones; and 88 hymns to gods and natural powers. The first two works can hardly be earlier than the fourth century A.D., and most of the hymns are also late, though they may well contain earlier elements.

The scientific treatment of the Orphic mysteries was begun by Lobeck, *Aglaophamus* (Königsberg, 1829), whose work is still of great value. Consult also: Kern, *De Orphei Epimenidis Pherecydis Theogoniis* (Berlin, 1888); Maass, *Orpheus* (Munich, 1895), to be used with great caution. For the *Orphica*, see Herrmann, *Neue Heidelberger Jahrbücher*, vi. (Heidelberg, 1896). For the *Orphica*, see Herrmann, *Orphica* (Leipzig, 1805); Abel, *Orphica* (Berlin, 1885); Dieterich, *De Hymnis Orphicis* (Marburg, 1891). Consult: Knapp, *Ueber Orpheusdarstellungen* (Tübingen, 1895); Heussner, *Die altchristlichen Orpheusdarstellungen* (Leipzig, 1893).

ORPHEUS C. KERR. The nom-de-plume of Robert Henry Newell, intended to represent the sound of 'office-seeker.'

ORPIMENT. See ARSENIC.

ORR, or, HUGH (1717-98). An American inventor. He was born in Lochwinoch, Renfrewshire, Scotland, but at the age of twenty emigrated to the United States, and in 1739 settled at Bridgewater, Mass., where he worked as a gunsmith and manufacturer of edged tools. The five hundred muskets produced by him for the province are said to have been the first of American make. During the Revolutionary War his foundry cast for the United States Government quantities of cannon and cannon-balls. Among his numerous inventions was a machine for the cleaning of flax.

ORR, JAMES (1844—). A Scotch theologian and Church historian, born and educated in Glasgow. From 1874 to 1891 he was pastor at Hawick, and for the ten years following was professor of Church history in the Theological College of the United Presbyterian Church, from which post he went to Glasgow College to a chair of apologetics and theology. He visited America in 1895 and lectured at Chicago on modern German theology, and again in 1897, when he lectured at Allegheny and Auburn Theological seminaries. Dr. Orr took a prominent part in promoting union between the Free and Presbyterian Churches. His publications include: *The Christian View of God and the World* (1893); *Ritschlian Theology and Evangelical Faith* (1897); *Neglected Factors in the Study of the Early Progress of Christianity* (1899); *Early Church History and Literature* (1901); and *Progress of Dogma* (1902).

ORR, JAMES LAWRENCE (1822-73). An American political leader, born at Craytonville, S. C. He graduated at the University of Virginia in 1841, and was admitted to the bar two years later. The next year he was elected to the State House of Representatives, and from 1849 to 1850 represented his district in Congress. During his last term at Washington, he was Speaker of the House, and used his power to favor the Lecompton Constitution of Kansas and other measures of the slave power. Though a strong partisan of State's rights, he dreaded the consequences to South Carolina which he foresaw would follow the ordinance of secession passed by the conven-

tion of 1860, of which he was a member. After its passage, however, he accepted the appointment as one of the three commissioners sent to Washington to treat for the transfer of Federal property within the State, and after his return organized and commanded Orr's Regiment of South Carolina Rifles. Before they had seen any real service, however, he resigned his commission in 1862 to enter the Confederate Senate, of which he continued to be a member until the end of the war, when he was elected Governor of South Carolina as a Republican. Later he was for a time United States Circuit Judge, and from 1873 until his death was United States Minister to Russia.

ORRENTE, ôr-rân'tâ, Pedro (c.1570-1644). A Spanish painter, born at Montealegre, Province of Murcia. He probably was a pupil of El Greco at Toledo, but was an imitator of Jacopo da Ponte, after whose manner he painted chiefly Scriptural subjects, in which animals and landscape could suitably be introduced. Hence he was called the Spanish Bassano. He worked at Toledo, Murcia, and Valencia, where he established a prosperous school, then at Cuenca, Madrid, and Seville. Although he treated all kinds of subjects, he is the chief painter, among the Spaniards, of cattle, sheep, and other animals. The best of eight pictures by him in the Madrid Museum include the "Sacrifice of Isaac," "Repose of Lot's Family," and "Adoration of the Shepherds." The Dresden Gallery contains "Jacob Lifting the Stone from the Well" and the Vienna Museum, "Christ Healing the Sick" and "John the Baptist." An excellent portrait of himself is in the Louvre.

OR'RERY. An astronomical instrument, showing the motions of the planets round the sun, and of the satellites round their planets, which was in high repute during the eighteenth and beginning of the nineteenth centuries, though now regarded as a mere toy. The orrery was probably invented by Graham, but named after Charles Boyle, Earl of Orrery in Ireland. It is a combination of the old planetarium (q.v.) with other machines which showed the motions of the earth, moon, and planetary satellites. Though the construction of a machine which would exhibit accurately the motions, distances, and magnitudes of the planets is impossible, yet an orrery is in some degree useful as giving a general notion of the way in which the planetary motions are performed.

ORRERY, Earls of. See Boyle.

ORRIS ROOT (probably a corruption of *Iris* root). The rootstock (rhizome) of certain European species of Iris (q.v.), namely Iris Florentina, Iris Pallida, and Iris Germanica, the first of which yields the principal supply. Orris root was formerly used in many medical preparations as a stimulant, but is now almost entirely disused. It is sometimes chewed to sweeten an offensive breath. In drying it acquires a pleasant smell of violets, on which account it is used in perfumery.

ORSAY, ôr'sâ'. Alfred Guillaume Gabriel, Comte d'. See D'Orsay, Alfred Guillaume Gabriel, Count.

ORSEILLE, ôr'sâ'y'. See Archil.

OR'SHA. A town in the Government of Mohilev, Russia, situated on the Dnieper, about 45 miles north of Mohilev. It trades in grain to a considerable extent. Population, in 1897, 13,161.

ORSI, ôr'sê, Achille d' (1845—). An Italian sculptor, born at Naples, where he studied at the Royal Institute, and in 1875 won a stipend which enabled him to supplement his artistic training in Rome. At the international art exhibition of 1877, in Naples, a life-size group, "The Parasites," attracted universal attention by its vigorous characterization and detailed realistic treatment. His "Proximus Tuus," representing an exhausted peasant, found its way into the National Gallery in Rome.

ORSINI, ôr-sê'nê. A noble family of Rome, celebrated as the champions of the Guelphic cause against their hereditary enemy, the Colonna (q.v.). They trace their origin to the early centuries of the Christian Era, but first appear prominently toward the end of the twelfth century, when a member of the house was elected to the Papal throne as Celestine III. Their strife with the Colonna frequently plunged the city into turmoil, and their rule, like that of their rivals, pressed heavily on the inhabitants. The line of the Orsini divided into the seven branches of Pitigliano, San Savino, Tagliacozzo, Anguillara, Oppido, Bracciano, and Mentana. The only surviving branch is that founded in Naples by Francesco, first Duke of Gravina. The members of the family who attained especial distinction were: Giovanni Gaetano Orsini, who became Pope as Nicholas III. and Pietro Francesco degli Orsini, who ascended the Papal chair as Benedict XIII.—Paolo Orsini was a famous condottiere of the first half of the fifteenth century, and fought against Ladislas of Naples and Francesco Sforza. Virginio Orsini (died 1497) fought for the Papacy under Sixtus IV., and against it under Alexander VI. He made common cause with Charles VIII. of France in 1494, and was punished by imprisonment at Naples, where he died. Renzo da Ceri (died 1536) was a general in the service of Francis I. of France, and fought against the Emperor, Charles V. He conducted the defense of Rome against the Imperialist troops in 1527, and after the storming of the city held out for some time in the Castle of Saint Angelo. Paolo Giordano Orsini, Duke of Bracciano, was the husband of the unfortunate Virginia Accoramboni (q.v.).—Anne Marie de la Trémoille (1635-1722), widow of Adrien Blaise de Talleyrand, Prince of Chalais, married, in 1675, Flavio Orsini, Duke of Bracciano, and became an ardent and skillful supporter of the French policy at the Papal court. In 1701 she went with Philip V. to Spain in the official capacity of mistress of the Queen's household, but in reality as the young King's adviser. She sought to establish the Bourbon throne in Spain on a firm basis by creating a national party in support of the new King, and with the exception of a short period of disgrace, exercised almost absolute power at the Spanish Court till the death of Philip's Queen. After the marriage of Philip V. to Elizabeth Farnese she retired from Madrid, and lived in Holland, Genoa, and Rome. Consult: Litta, *Famiglie celebri italiane*, vol. viii. (Milan, 1819 et seq.); Combes, *La princesse des Ursins* (Paris, 1858).

ORSINI, Felice (1819-58). An Italian revolutionist, born in Meldola, and known for his attempt on the life of Napoleon III. While a

youth he engaged in conspiracies for the liberation of Italy, and in 1844 was condemned to the galleys for life. He was released in 1846, and took an active part in the revolution of 1848-49, fighting at Rome and Venice, and carrying on the revolutionary propaganda at Genoa and in the Duchy of Modena. Forced to flee the country, he found refuge in England, where he supported himself by lecturing and published *The Austrian Dungeons in Italy* (1856). In 1857 he went to Paris with the intention of assassinating Napoleon III., whom Orsini regarded as the greatest obstacle to the liberation of Italy. On the evening of January 14, 1858, as the carriage containing the Emperor and the Empress was drawing up before the opera house, Orsini and three companions, Pieri, Rudio, and Gomez, exploded a number of bombs, killing ten of the bystanders and wounding one hundred and fifty. The Emperor and Empress escaped unhurt. The conspirators were seized, tried, and sentenced, Orsini, Pieri, and Rudio to death, and Gomez to imprisonment for life. Rudio's life was spared at the intercession of the Empress, but Orsini and Pieri were executed on March 13, 1858. Consult: *Memoirs of Felice Orsini, Written by Himself* (Edinburgh, 1857); Montazir, *Felice Orsini* (Turin, 1862).

ORSK, ôrsk. A town of Eastern Russia in the Government of Orenburg, situated on the Ural River, 140 miles east of Orenburg. It has brick-kilns and tanneries, and is a trade centre of some importance. Population, in 1897, 14,036.

ORSON. See VALENTINE AND ORSON.

ORSOVA, ôr'shô-vō. A frontier town of Hungary, situated on both sides of the Cerna at its confluence with the Danube, on the Rumanian boundary, 94 miles east of Belgrade (Map: Hungary, H 4). Old Orsova, on the west bank of the Cerna, has a new harbor, with quarantine station, and is a free port, a first-class port of entry, and one of the principal stations for the steamers on the Danube. Its population in 1900 was 4610. New Orsova, on the east bank, is inhabited chiefly by Turks, its population being about 3000, and was formerly a Turkish fortress, but has been held by Austria since 1878.

ORTEGAL, ôr'tâ-gäl'. CAPE. See CAPE ORTEGAL.

ORTE'LIUS, ORTEL, or **OERTEL**, ôr'tēl, ABRAHAM (1527-98). A Flemish geographer, born at Antwerp. He was the author of the famous atlas, *Theatrum Orbis Terrarum* (1570), long authoritative throughout Europe; *Thesaurus Geographicus* (1596); *Itinerarium per Nonnullas Galliæ Belgicæ Partes* (1584); and other geographical works. Philip II. of Spain recognized his merits, and appointed him royal geographer in 1573.

ORTH, ôrt, AUGUST (1828-1901). A German architect. He was born at Windhausen, Duchy of Brunswick, and educated at the Collegium Carolinum in Brunswick (1850-55), and at the Academy of Architecture in Berlin, where he also frequented the studio of Strack, and in 1856 won the Schinkel prize. After a visit to Italy in 1859, he was active principally in Berlin, where, besides such public buildings as the Görlitz railway station and the Cattle Market, the erection of several church edifices claimed more especially his attention. These comprise the "Zionskirche" (1866-73), the "Dankeskirche" (1884), the "Friedenskirche" (1891), the "Himmelfahrtskirche" (1891-93), and the "Emmauskirche" (1893), in all of which the architect endeavored to modify Romanesque forms of style according to modern proportions and exigencies.

ORTH, ôrth, GODLOVE STONER (1817-82). An American legislator, born in Lebanon County, Pa. He graduated at Pennsylvania College, studied law, was admitted to the bar in 1839, and in the same year began to practice in Indiana. He represented his district in the Indiana State Senate for six sessions (1842-48) and was for one year president of that body. In 1861 he represented Indiana at the Peace Conference. In the Civil War, as captain of volunteers, he commanded the ram *Horner* in defensive cruises along the Ohio in 1862. Elected to Congress from Indiana, he served from 1863 to 1871, and from 1873 to 1875; framed the 'Orth Bill,' which reorganized the diplomatic and consular systems; and resigned his seat to accept the mission to Austria. After his return he again served in Congress from 1879 until his death.

ORTH, JOHANN. See JOHN NEPOMUK SALVATOR.

ORTH, ôrt, JOHANNES (1847—). A German pathologist. He was born at Wallmerod, and studied under Rindfleisch at Bonn and Virchow in Berlin. In 1887 he became professor of pathology at Göttingen, and in 1902 succeeded Virchow at Berlin. His works are: *Compendium der pathologisch-anatomischen Diagnostik* (1876; 6th ed., 1900); *Cursus der normalen Histologie* (1878; 5th ed., 1888); *Lehrbuch der speziellen pathologischen Anatomie* (1887-93, incomplete); and *Medizinischer Unterricht und ärztliche Praxis* (1898).

ORTHERIS, STANLEY. A character in Kipling's *Soldiers Three*, and other tales of English army life in India. Mulvaney, Learoyd, and he are, in a way, 'Three Guardsmen' of to-day. In this little Londoner, Kipling has immortalized the Cockney, and given an actual type of the British soldier.

OR'THIS (Neo-Lat., from Gk. ὀρθός, *orthos*, straight, correct). An important extinct genus of hinged brachiopods very common in the Paleozoic formations of all parts of the world. The shells are usually rounded in outline, the valves generally convex, through the dorsal valve is flat in some genera, the cardinal area is well developed, and the hinge is a ball and socket mechanism. The several hundred known fossil species have been distributed among a number of new genera and subgenera, of which the more important are *Dalmanella testudinaria* of the Trenton limestone, *Bilobites biloba* of the Niagara beds of North America, and the Gotlandian beds of Europe, *Platystrophia biforata* of the Ordovician of America and Europe, *Rhipidomella vanuxemi* of the Hamilton group, and *Schizophoria striatula* of the Devonian. The period of greatest development of the orthids was during the Middle Paleozoic, and they died out toward the end of the Carboniferous period.

ORTHOCERAS, ôr-thŏs'ê-rās (Neo-Lat., from Gk. ὀρθός, *orthos*, straight, correct — κέρας, *keras*, horn). A genus of fossil nautiloid cephalopods, characterized by straight conic shells, whose surface may be either smooth or trans-

versely striated. The interior of the shells is divided into chambers by simple transverse septa, and there is a median siphuncle. The members of this genus, which range from the Silurian to the Triassic periods, are of much importance as index fossils. The limits of the genus as defined by the majority of writers have been so broad as to include almost all of the straight-shelled Paleozoic cephalopods, and the assemblage of species thus brought together was found by Hyatt and other investigators to contain species that belong more properly in a number of different families and several new genera. All of the straight-shelled forms are now classed together in an artificial group as orthoceracones, in distinction to the curved shells or cyrtoceracones. The orthoceracones are in general antecedent to the cyrtoceracones in each family or race. They appear first in the Upper Cambrian and are very abundant in the Ordovician rocks, where *Orthoceras titan* of the Black River limestone, with a length of about ten feet, is the largest known form of this group of cephalopods. During the Ordovician the orthoceracones gave rise to several derived genera of curved and coiled shells, and to shells with peculiarly restricted apertures. Some of these forms gave rise to side lines of evolution that flourished for variable periods of time, such as Cyrtoceras, Gyroceras, Lituites, Phragmoceras, and Ascoceras. Nautilus itself, which has persisted to the present day, was derived in early Ordovician times from one of these orthoceracones through a curved shell like Cyrtoceras. During the Silurian, Devonian, and Carboniferous periods the orthoceracones diminish in both size and number, and they disappear during the Trias. The derivation of Belemnites of the Mesozoic from some Paleozoic orthoceracones is considered by some authors to have taken place through the formation by the orthoceras of a heavy deposit of lime upon the apical portion of its shell, this serving as a post to anchor the shell in an upright position in the mud of the sea bottom. Consult: Ruedemann, "Professor Jaekel's Theses on the Mode of Existence of Orthoceras and Other Cephalopods," *American Geologist*, vol. xxxi. (Minneapolis, 1903); Von Zittel and Eastman, *Text-book of Paleontology*, vol. i. (New York and London, 1900). See CEPHALOPODA; NAUTILUS.

OR'THOCLASE (from Gk. *ὀρθός, orthos*, straight, correct + *κλᾶσις, klasis*, fracture, from *κλᾶν, klan*, to break). One of the monoclinic feldspars, composed of potassium-aluminum silicate. It has a vitreous lustre, and is either colorless or white, though occasionally light yellow or red, and sometimes green. It usually occurs in crystalline rocks, and is an essential constituent of granite, gneiss, syenite, porphyry, etc. The several varieties of orthoclase include *adularia*, a transparent or translucent variety that shows when polished chatoyant or pearly reflections, the best varieties of which are cut into gems and are known as 'moonstones;' *aventurine*, a similar variety with red and yellow internal reflections, due to minute scales of occluded minerals, the green varieties being known as 'sunstones;' *perthite*, a flesh-red variety containing layers of albite and often yielding bright golden-yellow reflections; and *variolite*, a dark-green variety, which takes its name from its supposed power to cure smallpox.

ORTHO'EPY (Gk. *ὀρθοέπεια, orthoepeia*, correct speaking, from *ὀρθοεπεῖν, orthoepein*, to speak correctly, from *ὀρθός, orthos*, straight, correct + *ἔπος, epos*, word). That part of grammar which treats of the correct pronunciation of the words of a language.

ORTHOGENESIS (Gk. *ὀρθός, orthos*, straight, correct + *γένεσις, genesis*, origin). Generation according to ordinary processes, as distinguished from such aberrant courses of development as parthenogenesis, alternation of generations, and other special modes.

ORTHOGONAL. See PROJECTION.

ORTHOG'RAPHY (Lat. *orthographia*, from Gk. *ὀρθογραφια*, correct writing, from *ὀρθός, orthos*, straight, correct + *γράφειν, graphein*, to write). The art of writing words correctly, as regards spelling. The word is seldom used in an absolute sense—that is, with the meaning of spelling which is scientifically correct—since outside of the discussions of phonetists (see PHONETICS) such spelling does not exist; it ordinarily signifies merely the art of spelling in accordance with accepted or prevailing usage, and also such customary spelling itself. See SPELLING and SPELLING REFORM.

ORTHOGRAPHY, FIGURES OF. Deviations from the ordinary accepted spelling of words. They are three in number; *archaism, crasis*, and *mimesis*. *Archaism* consists in spelling words according to a usage which is obsolete or obsolescent, as if one should write, "The *gret Kyng hathe* fifty fair *damyselles alle maydenes*." So Vergil has *olli* for *illi*, Horace *duellum* for *bellum*. *Crasis* (Gk. *κρᾶσις*, a mixing) in Greek grammar denoted the mixing of two words by the coalescence of their final and initial vowels into one long syllable. Thus *τὰ αὐτά* became *ταὐτά*. The occurrence of crasis is indicated by the *coronis* (᾽) placed over the vowel or diphthong of the resulting long syllable. In Latin grammar the term crasis was applied to the union of any two vowels into a long vowel or diphthong, and so became synonymous with contraction. Examples of crasis in Latin are *cogo* (for *coago*), *nil* (for *nihil*), *cors* (for *cohors*). *Mimesis* (Gk. *μιμησις*, imitation) consists in the representation of the improper pronunciation of words by means of false spelling. Mimesis is common in works which profess to represent the speech of the illiterate, or which introduce characters who use dialect, or negro speech.

OR'THOPÆ'DICS (from Gk. *ὀρθός, orthos*, straight, correct + *παῖς, pais*, child). The prevention or correction of deformity in the human body, especially in children. See CLUBFOOT; KNOCK-KNEE; LEG; POTT'S DISEASE; DEFORMITIES.

ORTHOP'ODA (Neo-Lat. nom. pl., from Gk. *ὀρθός, orthos*, straight, correct + *πούς, pous*, foot). An order of dinosaurs, in the system of Gadow, embracing the groups Stegosauria and Ornithopoda of Marsh. See the sections on these groups under DINOSAURIA.

ORTHOP'TERA (Neo-Lat. nom. pl., from Gk. *ὀρθόπτερος*, having upright wings, from *ὀρθός, orthos*, straight, correct + *πτερόν, pteron*, wing). A large and important group of insects comprising the forms known as the straight-winged insects, and including the grasshoppers or true locusts, long-horned grasshoppers (in-

cluding katydids), crickets, cockroaches, walking-sticks, and leaf-insects, and the praying mantis or rear-horse (qq.v.). The mouth parts are fitted for biting, and the metamorphoses are incomplete, the young when first hatched closely resembling the adult insects except in lacking wings. The eggs are few in number, and as a rule are laid in specialized egg-cases, although with some they are deposited without such cases, and with a few are scattered singly. The fore wings are somewhat thickened, but are not as tough as the wing-cases of beetles, and when at rest lie closed upon the back so as to protect the abdomen and the hind wings. They are known as 'tegmina.' The hind wings function in flight, and are delicate and usually folded like a fan. About 10,000 species exist, which makes it a small order when compared with the Hymenoptera, the Coleoptera, and the Lepidoptera, but, in spite of the comparatively small number of eggs, many of the species are tenacious of life and apparently very prolific, and swarm in enormous numbers of individuals, as in the case of the destructive and migratory locusts. One of the striking peculiarities of the order is that we find here most highly developed the ability to produce sounds of a more or less musical character, by rubbing one part of the body, modified for the purpose, upon another. This capability thus to make sounds is confined to the male sex, and its object is to attract the female; and this ability belongs only to the families which jump (the Saltatoria); the runners, walkers, and graspers (Cursoria, Gressoria, and Raptoria) make no sound, but in these groups the phenomena of protective and aggressive resemblances are very highly developed, especially in the tropical forms. In these groups the wings seem to be of little use as organs of flight, but they are of striking value in ornamentation and in concealment. This is especially true with the Phasmidæ and Mantidæ, where the effectiveness of color and pattern is extraordinary, the tegmina resembling plant structures with remarkable minuteness of detail. Even the eggs are so modified as to resemble the seeds of plants.

Orthoptera are among the oldest of fossil insects. Cockroaches were numerous and varied in Paleozoic time, and the other families are numerously represented in Mesozoic and Tertiary rocks.

Consult: Sharp, *Cambridge Natural History* (London, 1895); Comstock, *Manual for the Study of Insects* (Ithaca, 1898); Howard, *The Insect Book* (New York, 1902); Lugger, *Annual Report of the State Entomologist of Minnesota* (Minneapolis, 1898); Scudder, *North American Orthoptera* (Cambridge, 1897).

ORTIGUEIRA, ôr'tē-gā'ē-rā. A town in the Province of Coruña, Spain, picturesquely situated in a beautiful valley at the head of a land-locked bay 23 miles northeast of Ferrol. The harbor is well sheltered, but shallow, and has no wharves; the town is chiefly noted for its romantic surroundings and for the good seabathing afforded. Population (commune), in 1887, 17,563; in 1900, 18,975.

ORT'LER, or ORTLER SPITZE. The highest peak of the Austrian Empire, on the border of the Tyrol, 68 miles southwest of Innsbruck. It rises to a height of 12,790 feet from the northern portion of the Ortler group, in the chain of the Rhætian Alps. It was first ascended in 1804. The view from the summit is the most imposing of the Eastern Alps.

ORTOLAN (Fr. *ortolan*, from It. *ortulano*, ortolan, gardener, from Lat. *hortulanus*, gardener, from *hortus*, garden). A European bunting (*Emberiza hortulana*) having a plumage of mixed browns, black, and white. It appears in the autumn in great flocks on both coasts of the Mediterranean Sea, when it returns from its summer home and breeding places in the far north. No bird is so highly esteemed by epicures, and vast numbers are used for the table. It is taken chiefly by nets. See Plate of BUNTINGS.

In America the name is given to both the bobolink ('reed-bird') and the sora-rail, neither of which has the slightest relation to an ortolan, but both of which are small birds, much sought after in the fall in the Middle States, as a delicacy.

OR'TON, EDWARD (1829-99). An American educator and geologist. He was born in Deposit, N. Y., graduated at Hamilton College in 1848, and studied at Lane Theological Seminary, at the Lawrence Scientific School, Harvard, and at Andover Theological Seminary. He taught successively at the State Normal School, Albany, N. Y., at the Chester (N. Y.) Academy, and at Antioch College, of which he was also president in 1872-73. He was first president of the Ohio Agricultural and Mechanical College (now Ohio State University) (1873-81), and was professor of geology there from 1873 to 1899. He was an assistant State geologist (1869-82), was State geologist (1882-99), served for a time on the geological surveys of the United States, of Kentucky, and of Kansas, and was president of the Geological Society of America (1896), and of the American Association for the Advancement of Science (1898-99). He was essentially an economic geologist, and specialized in the study of oil and gas, developing several well-known theories, notably the 'anticlinal theory,' and becoming widely known as an authority on the nature and geological occurrence of these products. He wrote portions of vols. i., ii., and iii. of the *Reports* of the Ohio Geological Survey, and a large part of vols. v., vi., and vii., besides numerous papers in the geological magazines and papers on petroleum, gas, and asphalt in the *Kentucky Geological Reports* (1891), and in the *Report* of the United States Geological Survey (1887).

ORTON, JAMES (1830-77). An American naturalist, born at Seneca Falls, N. Y. He graduated at Williams College in 1855, and then studied theology at the Andover Seminary. In 1860 he returned from an extensive trip through Europe and Palestine, and was ordained a Congregational minister. He became professor of natural science in Rochester University in 1866, in the next year he took charge of a scientific expedition across South America, and in 1873 took part in an expedition to Lima and Lake Titicaca. From 1869 to the time of his death he was professor of natural history in Vassar College. He published *The Miner's Guide and Metallurgist's Directory* (1849); *The Andes and the Amazon* (1870); and *Comparative Zoölogy* (1875).

ORTONA, ôr-tō'nä. A town in the Province of Chieti, Italy, situated on the Adriatic, 12 miles east of Chieti (Map: Italy, J 5). It has a cathedral, a ruined castle, a harbor, and an

extensive trade in wine. Population, in 1881, 12,122; in 1901, 14,974.

ORTYGAN (Neo-Lat. *ortyx* (ortyg) + an, from Gk. ὄρτυξ, quail). A button-quail (q.v.) or bush-quail of the Old World genus Turnix, which includes a large number of diminutive game-birds of pleasing appearance and excellent qualities. These birds are called 'hemipods' in the older books.

ORTYGIA, ôr-tij'i-â. An ancient name of Delos (q.v.).

ÖRTZEN, ö'rt-sen, Georg, Baron (1829—). A German poet. He was born at Brunn, Mecklenburg-Strelitz; studied law, served in the Prussian Army (1850-55), and then entered the consular service. He was employed in New York (1879), Constantinople (1880), Marseilles (1881), and Christiania (1889), and retired in 1892. He wrote several volumes of verse, including: *Gedichte* (3d ed. 1861); *Aus den Kämpfen des Lebens* (1868); *Satiren und Glossen eines Weltmannes* (1874); *Epigramme und Epiloge in Prosa* (1880); *Eines Lyrikers Chronik* (1888); *Auf Schwarzwaldwegen* (1896); *Nacht* (1900); and *Symphonien des Windes* (1901). Under the pseudonym "Ludwig Robert" he published *Erlebnisse und Studien in der Gegenwart* (1875).

ORU'BA. An island of the Dutch West Indies. See Aruba.

ORURO, ô-rōō'rō. A western department of Bolivia, bounded by the Department of La Paz on the north, Cochabamba on the east, Potosi on the south, and by Chile on the west (Map: Bolivia, D 7). Area estimated at 21,321 square miles. The surface is an elevated plateau, a part of the great Titicaca basin, and is interspersed with marshes and arid plains. The climate is cold and the soil mostly unfit for agriculture, though some cattle-raising is carried on. The mineral deposits of the State are rich, including tin, silver, and copper, which are profitably mined. The civilized population was officially estimated in 1898 at 130,000, including over 90,000 Indians. The capital is Oruro.

ORURO. The capital of the Department of Oruro, Bolivia, situated 9 miles east of the Desaguadero River, in a valley bordering an arid plain, 12,200 feet above sea level, and 120 miles southeast of La Paz (Map: Bolivia, D 7). A portion of the city is in ruins, and its former fine public buildings are in a decayed condition. A railroad connecting the town with Antofagasta on the Chilean coast has somewhat revived its importance, which is derived mainly from the valuable tin mines in the neighborhood. Population, 16,000. Oruro was founded in 1606.

ORVIETO, ôr-vyā'tô. A town and episcopal see of Central Italy, in the Province of Perugia, with a station on the Rome-Florence Railroad, 60 miles northwest of Rome (Map: Italy, F 5). It occupies a strong position on a steep hill, 1165 feet high, accessible by an inclined railway, is well built, and is surrounded by walls. It has been the see of a bishop since A.D. 509. The cathedral, a beautiful specimen of the Italian Gothic, and one of the most richly decorated edifices in Italy, is of black and white marble; it was begun in 1290 and completed about the middle of the fourteenth century. The façade is unsurpassed in the beauty of its mosaics, sculptures, and elaborate ornamentation. The interior is also finely decorated with sculptures and paintings. There are several other churches, chief of which is the Gothic San Giovenale, dating from the eleventh century. Other interesting features are the castle with the public garden and amphitheatre, Saint Patrick's Well, and the former Papal palace, or Palazzo Soliano, with a museum containing mediæval works of art and a collection of antiquities, most of them found in an Etruscan necropolis between the town and the railroad station. The city trades in grain, cattle, silk, oil, and white wine. Population (commune), in 1881, 15,931; in 1901, 18,543. Orvieto, known in the Middle Ages as 'Urbs Vetus,' occupies the site of an ancient and wealthy Etruscan city. It was repeatedly a place of refuge for the popes.

ORYX, ō'riks (Lat., from Gk. ὄρυξ, *oryx*, gazelle, pickaxe, from ὀρύσσειν, *orysscin*, to dig). A large antelope of Northern Africa (*Oryx leucoryx*), distinguished by its uniform whitish color, often reddish on the under part, and by the sabre-like curve of the great horns, which may touch the rump when the head is thrown back. These horns are able to sweep around with immense force and effect, and hunters find oryxes dangerous animals to approach when wounded. This species, which is confined to the Eastern Sudan and Nubia, is known by the Arabs as 'abu harte,' and represents the genus which includes the gemsbok, addax, beatrix antelope, beisa (qq.v.), and some other species of the desert and plains regions of Africa. The word 'oryx' among the ancients was the name of an antelope often represented on the monuments of Egypt, usually in profile, so that it seems to have but one horn. It is evident that one or another species of this genus was portrayed; and the fable of the unicorn may have arisen from these mural paintings.

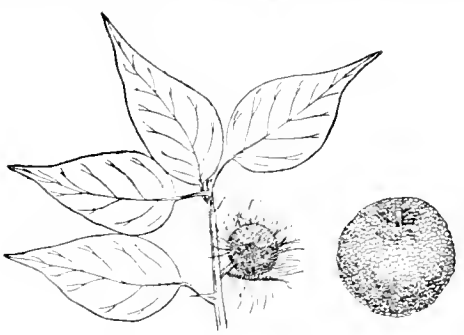
ORZESZKOWA, ôr'zhesh-kō'vâ, Eliza (1842—). A Polish novelist. She was born near Grodno; at sixteen married a Polish noble, who was banished to Siberia in 1863; and after that time devoted herself to literature and the advocacy of woman's rights. Her more important novels are: *Eli Makower* (1874), which treats of the relations of the Jews to the Polish nobility; *Meir Ezofowicz* (1878), which bears upon the contest between Talmudic orthodoxy and liberal theology in a rural setting; *Lost Souls* (1886), and *Cham* (1888), sketches of life in White Russia; *On the Niemen* (1888), and *Bene Nati* (1892), both descriptive of the lesser nobility; as well as the earlier and more typical *Pan Graba* (1872). More recently she published *The Argonauts* (1889) and *The Votaries of Power* (1900). Her collected works, with a biography by Chmielowsky, appeared at Warsaw (1899).

OSAGE, ô-sāj', *or* ō'sâj (properly *Ouasage*, the French form of *Washashe*, or *Wasash*, the name used by themselves). An important Indian tribe of Siouan stock (q.v.), formerly holding an extensive area between the Missouri and Arkansas rivers, in what is now Missouri, Arkansas, Kansas, and the Indian Territory, and at present gathered upon a reservation in northeastern Oklahoma. They are mentioned by Marquette as early as 1673, and through the colonial period generally acted as allies of the French against the other tribes, who seem almost without exception to have considered them as com-

mon enemies in whom no faith could be placed. Their principal wars were with the Cherokee and Chickasaw in the east and with the Kiowa, Cheyenne, Pawnee, and others on the plains. By successive cessions, beginning in 1808, they sold their original extensive territory until their removal to their present reservation in 1870, but through the aid of competent lawyers were able to secure such terms that they are now the richest tribe per capita in the United States, their annual income from invested funds and current leases being about $600,000, or over $300 for every man, woman, and child in the tribe. The result, however, has been rather detrimental than otherwise, tending to encourage dissipation and hinder industrial progress. From an estimated population of over 6000 a century ago they have diminished to 3000 in 1875 and 1790 in 1901, of whom only about 800 are full-bloods.

OSAGE. A city and the county-seat of Mitchell County, Iowa, 157 miles northwest of Dubuque, on the Red Cedar River, and on the Illinois Central and the Chicago Great Western railroads (Map: Iowa, E 1). It has the Sage Public Library, with 3000 volumes, and Cedar Valley Seminary; and near the city are the fair grounds of the County Agricultural Society. Osage is of considerable importance as the shipping point of a productive farming, stock-raising, and dairying section, and there are large nursery interests. The water-works are owned by the city. Population, in 1890, 1913; in 1900, 2734.

OSAGE ORANGE, or Bow Wood (so called from the Osage Mountains in Arkansas, of which it is a native), *Maclura aurantiaca*. A North American tree of the natural order Urticaceæ, which attains a height varying, according to soil and situation, from 20 to 60 feet. Its wood, which might probably be used for dyeing as a substitute for fustic (q.v.), is bright yellow, fine-



LEAVES AND FRUIT OF OSAGE ORANGE.

grained, and very elastic, and was much used by the North American Indians for making bows. The tree has been successfully used in many places as a hedge plant, its thorny stems forming an impenetrable barrier when properly trained. Its inedible fruit, which is about the size of a large orange, has a tuberculated surface of a golden color, and is filled internally with radiating somewhat woody fibres, and with a yellowish milky juice, the odor of which is generally disliked. The leaves of the Osage orange have been very successfully substituted for mulberry leaves in feeding silkworms.

OSAGE RIVER. A tributary of the Missouri. It rises in eastern Kansas, and flows in a winding course eastward through the State of Missouri, emptying into the Missouri River a few miles below Jefferson City (Map: Missouri, C 3). It is about 500 miles long, and navigable at high water for 200 miles.

OSAKA, ō-sä'kä, or **OZAKA**, ō-zä'kä (Jap., contraction of *Ō-ge-saka*, the great estuary hill, in allusion to the rising ground on which the castle stands). An important manufacturing and trading centre of Japan, and one of the three Imperial cities. It is situated on the island of Hondo, on both banks of the Yodo River, the outlet of Lake Biwa, and on the shores of Osaka Bay, in latitude 34° 42′ N., and longitude 135° 31′ E., 20 miles by rail from Kobé, and 27 from Kioto. It is built for the most part on low-lying level land. The city is intersected by the Yodo and numerous canals spanned by 1300 bridges, and has in consequence been styled the 'Venice of the East.' The streets are laid out with great regularity at right angles to each other, and are in the main narrow. The town has an average annual temperature of about 59° and a rather unhealthful climate.

Osaka has many industries, its principal manufactures being those of cotton, glass, and iron and steel products. Other important manufactures are boots and shoes, matches, tobacco products, clocks, etc. There is also considerable shipbuilding. A fine Government mint, for which 40 acres are used, was established here under foreign superintendence in 1871. In connection with it are a refinery and sulphuric acid works, which are a source of great profit to the Government. Osaka was opened in 1868 for foreign residence and trade, and a foreign settlement was laid out on the river island of Kawaguchi. The harbor, however, is poor and unsuited for large vessels, and Kobé has attracted most of the foreign trade, especially since the opening of the railway. The foreign settlement is, therefore, occupied for the most part by missionaries. Commercially Osaka is important chiefly in the internal trade, while in regard to foreign commerce it is only of slight importance in comparison with Yokohama and Kobé. The total foreign commerce of the port in 1901 amounted to over $11,000,000, the bulk of the trade being in cotton goods. Small steamers ply regularly between Osaka and the ports of Shikoku and the Inland Sea.

There are many temples and places of interest in the city and vicinity. The chief is the castle, which is one of the most famous in Japan. It stands on high ground in that part of the city known as the Upper Town. At the end of the fifteenth century its site was occupied by the monastery and temples of the Shin-shu sect of Buddhists, and was so strongly fortified by them that it defied the repeated attacks of the great general Nobunaga. In 1583 Hideyoshi (q.v.) made it the seat of his power and erected within the citadel a palace, which was, as some authorities believe, the most magnificent building the world ever saw. It survived the attack of Iyeyasu (q.v.) against Hideyori, Hideyoshi's son, but was burned by Tokugawa retainers in the civil war of 1868. It now contains the headquarters of the Osaka military district. Population of city, in 1898, 821,235; of the fu, 1,311,909.

OSAWAT'OMIE. A city in Miami County, Kan., 61 miles south by west of Kansas City, Mo., on the Missouri Pacific Railroad (Map:

Kansas, II 3). It derives its name from two streams near by, the Osage and Pottawatomie. It is the seat of the oldest and largest State insane hospital, with accommodations for about 1200 patients, dating from 1866, and has a Masonic temple, the Agnew Opera House, a city hall, and city library, and a monument commemorating the battle of Osawatomie. The city is in an agricultural and stock-raising region, and has a supply of natural gas. Division headquarters and shops of the Missouri Pacific Railroad are maintained here. The government is vested in a mayor, elected biennially, and a council. There are municipal water-works. Osawatomie was one of the 'free-State' settlements made by the Emigrant Aid Society in 1855, and was prominent in the contest between the pro-slavery and anti-slavery elements in Kansas. For a time John Brown lived in the immediate vicinity of the town. On August 30, 1856, it was the scene of a sharp skirmish between a band of pro-slavery men and John Brown and his followers, and, after the latter had been dispersed, was almost completely destroyed by the former. Osawatomie was chartered in 1883 and in 1890 became a second-class city. Population, in 1890, 2662; in 1900, 4191.

OSBALDISTONE. In Scott's *Rob Roy*, the name of two cousins, Francis and Rashleigh. Francis marries Di Vernon and Rashleigh, the villain of the story, is killed by Rob Roy.

OSBORN, ōz'bôrn, Henry Fairfield (1857—). An American geologist and paleontologist, born at Fairfield, Conn. He graduated at Princeton in 1877, and was appointed assistant professor of biology there in 1880, and professor of comparative anatomy in 1881. In 1890 he was made Da Costa professor of zoölogy in Columbia University, and was chosen curator of vertebrate paleontology in the American Museum of Natural History. Osborn's Western explorations resulted in great contributions to American paleontology and in remarkable additions to the collection of the American Museum. Of especial value are his reconstructions of prehistoric mammals, as painted by Charles Knight and displayed in the American Museum. In 1900 he was appointed paleontologist to the Canadian Geological Survey and to the United States Geological Survey. He wrote: *Evolution and Heredity* (1890); *From the Greeks to Darwin* (1894), an historical sketch of evolution; and *Hereditary Mechanism* (1895), and collaborated with W. B. Scott in the preparation of the work entitled *American Fossil Mammals*.

OSBORN, Sherard (1822-75). An English naval officer, explorer, and author, born in Madras, India. Entering the British Navy in 1837, he soon rose to a captaincy, and served in Malayan and Chinese waters. On two Arctic expeditions (in 1850-51 and 1852-54) in search of Sir John Franklin, he commanded a vessel, and during a part of the Crimean War he was senior officer in the Sea of Azov. Ordered to Hong Kong in 1857, he took a spirited part in the war at Canton (1857-58). In 1864 he commanded the armor-plated *Royal Sovereign*, and in 1873 became rear-admiral. His writings include: *Stray Leaves from an Arctic Journal* (1852); *Quedah; or, Stray Leaves from a Journal in Malayan Waters* (1857); and *The Career, Last Voyage, and Fate of Sir John Franklin* (1865).

OSBORNE, ōz'bôrn, Francis (1593-1659). An English author. He was the son of Sir John Osborne, of Chicksands, Bedfordshire, lived in London, where he was employed by his father, who was at the head of the office of the Lord Treasurer's remembrancer, and about 1650 removed from North Fambridge to Oxford. There he held minor office under the Commonwealth and lived uneventfully, gaining some fame and many influential friends in London after the publication of his *Advice to a Son* (1656-58). This popular work was published anonymously. It contained a series of pithy commonplaces somewhat in the manner of Lord Chesterfield. Besides several political pamphlets, Osborne wrote a *Miscellany of Sundry Essays, Paradoxes*, etc. (1659). His collected works were published in 1673, and in 1722 reached an eleventh edition.

OSBORNE HOUSE. A country residence of Queen Victoria on the Isle of Wight, in the neighborhood of the town of East Cowes. Osborne House was bought by the Queen in 1840. Here she died, January 22, 1901. After her death King Edward presented Osborne House to the English people.

OSBOURNE, ōz'bûrn, Lloyd (1868—). An American writer, son of Samuel Osbourne and Fanny Van de Grift (afterwards the wife of Robert Louis Stevenson). He was born in San Francisco, April 7, 1868, and studied at the University of Edinburgh with a view to becoming a civil engineer. With Stevenson he went to Samoa, where he was appointed vice-consul from the United States. In conjunction with Stevenson, he wrote: *The Wrong Box* (1889); *The Wrecker* (1892); and *Ebb Tide* (1894).

OS'CAN. One of the ancient languages of Italy. See Italic Languages.

OSCAR I. (1799-1859). King of Sweden and Norway from 1844 to 1859. He was born in Paris, July 4, 1799, being the son of Marshal Bernadotte. (See Charles XIV. John.) After the election of his father as Crown Prince of Sweden, Oscar received the title of Duke of Sudermania. In 1818 he entered the University of Upsala. He was accomplished in the fields of science, literature, and the fine arts, and was an enthusiastic student of music. He was in full sympathy with the Swedish nationalists. He succeeded his father March 8, 1844. His rule was distinguished for its justice; and many liberal measures, such as the removal of Jewish disabilities, freedom of manufactures and commerce, and parliamentary reform (the last mentioned being vigorously opposed by the nobility), were laid before the *Riksdag* by his orders. He advocated these changes with tact, and in many cases his policy was successful. In 1823 he married Josephine Beauharnais, the granddaughter of the Empress Josephine, by whom he had five children, the eldest of whom, on account of his father's failing health, was appointed Regent, September 25, 1857, and succeeded to the throne as Charles XV. on the death of Oscar, July 8, 1859. See Sweden.

OSCAR II. (1829—). King of Sweden and Norway after 1872. He was born in Stockholm, January 21, 1829, being the third son of Oscar I. In 1872 he succeeded his brother, Charles XV., on the throne. During his reign the development of the sister kingdoms was retarded by no for-

eign complications and received an effective stimulus in the efforts of the King, who showed himself a generous patron of industry, science, and the arts. On the question of the vexed relations between Sweden and Norway, arising from the latter kingdom's struggle for self-government, he firmly opposed all attempts looking toward the dissolution of the union between the kingdoms, but otherwise showed himself in favor of concessions to the Norwegians. He has also attained some note as a writer, the list of his works including: *Charles XII.; Prose Writings;* a number of volumes of lyric poetry, and a translation of Goethe's *Tasso*. His collected writings were published at Stockholm in 1885-94. In 1857 he married Princess Sophie of Nassau, by whom he had four sons.

OSCEOLA, ŏs'ē-ō'lȧ (Seminole *As-se-ho-hołar*, Black Drink) (c.1804-1838). A famous Seminole chief, born near the Chattahoochee River, Ga. His father was an English trader and his mother an Indian woman, the daughter of a Creek chief. Removing to Florida when very young, he there acquired great influence among the Seminoles, and took the lead in opposition to the territorial aggressions of the whites. In 1835 his wife, the half-breed daughter of a fugitive negro slave, was reclaimed as a slave by her mother's former owner, and Osceola, infuriated, threatened revenge, and was temporarily imprisoned. On being released, he began the attacks on the whites which opened the second Seminole War (see SEMINOLE), and in December he killed with his own hand the Indian agent Thompson. For two years he was in almost every important engagement, and, by his shrewdness, skill, and bravery, foiled several white generals in succession. Finally (October 31, 1837), he was treacherously seized while holding a conference under a flag of truce with Gen. Thomas S. Jessup, and was confined at Saint Augustine and Fort Moultrie until his death, January 20, 1838.

OSCHATZ, ō'shȧts. A town in the Kingdom of Saxony, on the Döllnitz, 32 miles west of Leipzig (Map: Germany, E 3). Its manufactures include sugar, felt, knitted goods, cloth, and leather. Population, in 1890, 9400; in 1900, 10,652.

OSCHERSLEBEN, ōsh'ĕrs-lā-bĕn. A town of the Province of Saxony, Prussia, on the Bode, a branch of the Saale, about 30 miles southwest of Magdeburg (Map: Prussia, D 2). It has sugar refineries, and manufactures agricultural implements, fertilizers, chocolate, bricks, and boilers. In the vicinity are lignite mines. Population, in 1890, 10,700; in 1900, 13,400.

OSCINES, ŏs'ĭ-nēz (Lat., singing birds). The great group of Passeres (q.v.) which includes the song birds. They are characterized by several distinct pairs of intrinsic muscles of the syrinx, inserted into the ends of the upper bronchial half-rings, and constituting thus a complex and effective vocal apparatus. Not all the Oscines sing, but all truly singing birds are Oscines. The side of the tarsus is usually covered with a horny plate, which forms a sharp ridge behind, with the corresponding plate of the other side. The primaries are nine or ten in number, but when ten the first is very short. The Oscines are the largest group of birds, and include about 5000 species of the 11,000 known birds. They are found in all parts of the world, but are perhaps most abundant in the temperate zones. Many of them are of very brilliant plumage, but as a rule the musical powers and intelligence are more noticeable than the beauty, and they are universally regarded as the most highly developed group of birds. Most of them are of comparatively small size, the very great majority being less than a foot in length. The raven (q.v.) is the largest of the suborder, while the kinglets (q.v.) are probably the smallest. Of our North American birds, about one-half are Oscines. For the anatomy and classification of the group, consult: Evans, *Birds* (New York, 1900); Newton, *Dictionary of Birds* (ib., 1893-96); Stejneger, *Standard Natural History*, vol. iv. (Boston, 1885).

OSCULATING CIRCLE. In geometry, a circle that has three, i.e., the greatest possible number, of consecutive points in common with a given curve. A curve can at any given point have more than one tangent circle, i.e. circles with which it may be imagined to have either one or two points in common; but it can, at any given point, have only one *osculating* circle, for only one circle can pass through three given points. The curvature of a curve at a given point is obviously identical with the curvature of its osculating circle at that point, and hence the osculating circle is often spoken of as the 'circle of curvature' of the curve at the given point.

OSCULATION (Lat. *osculatio*, a kissing, from *osculari*, to kiss, from *osculum*, kiss, little mouth, diminutive of *os*, Skt. *asya*, mouth). One curve is said to *osculate* another when the curves have several consecutive points in common, and the degree of osculation depends upon the number of points of contact; that is, the greater the number of consecutive points in contact, the higher the degree of osculation. The number of possible points of contact is determined by the number of *independent* arbitrary constants contained in the equation of the tangent curve. The same is true of a straight line and a curve. The equation of a straight line, being of the form $y = mx + c$, contains two arbitrary constants, m and c; hence a straight line can coincide with a curve in two consecutive points, and the contact is said to be of the first order. This straight line is the tangent at the point of contact. When a straight line, not a tangent, meets a curve, there is section instead of contact, and in that case only one point is common to the straight line and the curve. The general equation of the circle, $x^2 + y^2 + dx + ey + f = 0$, contains three arbitrary constants, d, e, and f, and therefore a circle can have three consecutive points in common with a curve, and the contact is of the second order. The circle is known as the circle of curvature or the *osculating* circle, and has for its radius the radius of curvature of that portion of the curve with which the circle is in contact. No other circle can have so high a degree of contact with a curve at any point as the osculating circle at that point. Surfaces and some twisted curves admit of spheres of osculation. See CURVE.

ÖSEL, ē'zl, or **OESEL**. A large island in the Baltic Sea, belonging to the Russian Government of Livonia, and situated at the entrance to

the Gulf of Riga (Map: Russia, B 3). It has an area of 995 square miles. It is irregular in outline, with a long and narrow peninsula extending southward toward the Domesnäs of Courland, and its coasts are indented with numerous small bays, offering, however, few harbors. The surface is undulating, in parts marshy and but sparsely forested. The soil is not unfertile, and the climate is mild enough to permit the cultivation of all the common cereals, including wheat. The chief occupations of the inhabitants are agriculture, fisheries, and the rearing of cattle and horses. The population, including that of some small dependent islands, was, in 1897, 56,869, chiefly Esthonians. The principal town is Arensburg, on the southeast coast, with a population, in 1897, of 4621. Oesel was occupied by the Knights Swordbearers early in the thirteenth century, and when their power was broken it was sold in 1559 by its bishop to Denmark. In 1645 it was ceded to Sweden, and in 1721 it came into the possession of Russia.

OS'GOOD, Frances Sargent (Locke) (1811-50). An American poetess, born in Boston. When but a girl she contributed poems to the "Juvenile Miscellany" of Lydia Maria Child and won some reputation, which she increased by other poems and by editorial work. In 1835 she married Samuel S. Osgood, a portrait painter, and visited England, where she published among other works a collection of poems called "A Wreath of Wild Flowers from New England" (1839), and a play written at the request of Sheridan Knowles, "The Happy Release, or The Triumphs of Love." A *Memorial* by friends, with an account of her life by Griswold, was printed in New York in 1851. A complete illustrated edition of her poems appeared in 1850.

OSGOOD, George Laurie (1844—). An American musician and director. He studied voice-culture under Sieber, Haupt, and Robert Franz in Germany, and under Lamperti in Italy. Largely through the success he had achieved in Germany, Theodore Thomas engaged him for a winter tour in America. In 1872 he took up his residence in Boston as a vocal teacher, and three years later became conductor of the Boylston Club. In 1890 he also took charge of the Boston Singers' Society. His anthems, choruses, part songs, and songs are well known. He published a *Guide in the Art of Singing*, which was favorably received.

OSGOOD, Samuel (1748-1813). An American soldier and politician, born in Andover, Mass. After graduation at Harvard College (1770), ill health compelled him to exchange a mercantile career for the theological studies already undertaken. Having been a delegate to the Essex County (Mass.) Convention (1774), and active in the Provincial Congress, in 1775 he served as captain of minute-men at Lexington and Concord. For a short time he was aide to General Artemas Ward, but left the army to reënter the Provincial Congress. From 1780 to 1784 he was a member of the Continental Congress, and from 1785 to 1789 first Commissioner of the United States Treasury. He was later Postmaster-General, Speaker of the New York Assembly, State supervisor, and naval officer of New York port.

OSGOOD, Samuel (1812-80). An American clergyman, born at Charlestown, Mass. He was graduated at Harvard College in 1832, and at the Cambridge Divinity School in 1835. In 1836-37 he edited the *Western Messenger* at Louisville, Ky. In 1837 he became pastor of the Unitarian Church at Nashua, N. H., in 1841 of the Westminster Church in Providence, R. I., and in 1849 of the Church of the Messiah in New York. In 1850-54 he was editor of the *Christian Inquirer* in New York. In 1870 he entered the Protestant Episcopal Church, but took no pastoral charge. He was the author of *Studies in Christian Biography* (1851); *God with Men* (1853); *The Hearthstone* (1854); *Milestones in Our Life Journey* (1855); *Student Life* (1860); *American Leaves* (1867); translations from Olshausen's *The History of the Passion* (1839), and De Wette's *Human Life* (1842).

OSH, ôsh. A town in the Territory of Ferghana, Russian Turkestan, situated about 60 miles east of Margelan. It consists of the old native town and the new Russian settlement, and is of some importance in the trade with China. Population, in 1897, 36,474, including over 34,000 Mohammedans.

O'SHAUGHNESSY, ô-shą'ne-sī, *or* ô-shąK'ne-sī, Arthur William Edgar (1844-81). An English poet, born in London, March 14, 1844. In 1861 he was appointed assistant in the library of the British Museum; two years later he was transferred to the department of natural history, a post which he held till his death, January 30, 1881. His verse comprises *The Epic of Women and Other Poems* (1870); *Lays of France* (1872), based upon the *lais* of Marie de France; *Music and Moonlight* (1874); and *Songs of a Worker* (posthumous, 1881). The first volume especially contains pieces of great beauty. O'Shaughnessy belonged to the Neo-Romantic School more completely represented by William Morris and Swinburne. In 1873 he married Eleanor, daughter of Westland Marston. She died in 1879. In collaboration with her he wrote *Toyland* (1875), a collection of tales for children. Consult Moulton, *O'Shaughnessy, His Life and His Work* (London and Chicago, 1894).

OSHAWA, ŏsh'ä-wä. A port of Ontario County, Ontario, Canada, on Lake Ontario and on the Grand Trunk Railway, 33 miles northeast of Toronto and 6½ miles east of Whitby (Map: Ontario, E 4). It has iron foundries and factories, flour mills, etc. Population, in 1891, 4066; in 1901, 4394.

O'SHEA, ô-shā', Michael Vincent (1866—). An American educator, born at LeRoy, N. Y. He graduated at Cornell University in 1892, taught for three years in the Mankato (Minn.) Normal School, and, after serving as professor of education in the Buffalo Teachers' College, in 1897 was appointed to a like chair in the University of Wisconsin. He became prominent in university extension work and as a lecturer on pedagogy. His publications include: *Aspects of Mental Economy* (1900); and, in a series under his editorial charge, *Education as Adjustment* (1903), and *Education for Efficiency: Chapters on Method and Management in Teaching* (1903).

OSHIMA, ō'shê-mä' (Jap., Big Island). The name of at least twenty places in Japan. The two most important are: (1) The most northerly of the "Seven Islands of Idzu," which stretch

southward for 100 miles toward the Bonin Islands, and is best known to foreigners as Vries Island. It is of volcanic origin, is eight miles long and five wide, has a good harbor, and an ever-smoking volcano, Mihara-Yama. It has a population of about 5000, living in six villages along the coast. No rice is produced, as the people live principally by fishing and exporting cherry-tree wood to the main islands of Japan. A little corn and sweet potatoes are raised. The women do most of the work, and, as in the Loochoos, carry their burdens on their heads. Their dress differs considerably from the dress of the women of the mainland; they wear petticoats, dress their hair differently, and do not blacken their teeth. The men dress as other Japanese. Concubinage does not exist; musical instruments are not found, and dancing is unknown. (2) Anami-Oshima, one of the large islands of the Loochoo Archipelago (see LOOCHOO), which came under the control of the Daimio of Satsuma in 1609. It is 34 miles long and 17 wide; is of volcanic origin, with steep shores, and hills rising to heights of 1400 to 1500 feet. Here in 1867 a modern sugar-refining plant was erected by some foreigners for the Daimio of Satsuma, but, not proving remunerative, it was later removed. The port is Naze, with a good harbor, on the north coast, latitude 28° 23′ N., longitude 129° 30′ E. The inhabitants suffer much from very poisonous snakes of the genus Trimeresurus, which infest even the houses.

OSH'KOSH. A city and the county-seat of Winnebago County, Wis., 80 miles northwest of Milwaukee; on Lake Winnebago, at the mouth of the Upper Fox River, and on the Wisconsin Central, the Chicago and Northwestern, and the Chicago, Milwaukee and Saint Paul railroads (Map: Wisconsin, E 5). It is the seat of a State normal school. In the suburbs, three miles distant, is the Northern Hospital for the Insane (State), and near it the County Asylum for the Incurable Insane and the County Poor Farm. The city has a public library, North, South, and Electric parks, and several bridges across the river. Among its notable structures are several public school buildings, the city hall, the county courthouse, and the United States Government building. Lake Winnebago is a popular resort for yachting, ice-boating, fishing, and hunting. Owing to the accessibility to valuable forests, Oshkosh has developed important lumber interests, and manufactures products of lumber in great variety—sash, doors, and blinds, matches, furniture, trunks, carriages and wagons, etc. Other manufactures are machinery, boilers, grass twine and matting, flour, tobacco, and malt liquors. The city's commercial interests are increasing, and include a large wholesale trade. The government is administered by a mayor, elected every two years, and a council, of which the executive is a member. The school board is independently elected by popular vote. Oshkosh was settled in 1836 and chartered in 1853. In 1859, 1866, 1874, and 1875 it suffered severely from fires. Population, in 1890, 22,836; in 1900, 28,284.

OSIANDER, ō'sē-ăn'dẽr, ANDREAS (1498-1552). A German reformer. He was born December 19, 1498, at Gunzenhausen, near Nuremberg. Osiander, whose real name was Hosemann, was educated at Ingolstadt and Wittenberg, and became a preacher at Nuremberg in 1522, where he was conspicuously active in introducing the Reformation. He advocated the views of Luther in his controversy with Zwingli, on the question of the Lord's Supper; took part in the conference held at Marburg (1529), and was present at the Diet of Augsburg (1530). In 1548 he was deprived of his office as preacher at Nuremberg, because he would not agree to the Augsburg Interim (see INTERIM); but was immediately invited by Albert, Duke of Prussia, to become the head of the theological faculty in the newly established University of Königsberg. He was hardly settled here when he became entangled in a theological strife that imbittered his naturally imperious and arrogant temper. In the treatises *De Lege et Evangelio* (1549) and *De Justificatione* (1550) Osiander asserted that the righteousness by which sinners are justified is not to be conceived as a mere justificatory or imputative act on the part of God, but as something inward and subjective, as the impartation of a real righteousness, springing in a mystical way from the union of Christ with man. The most notable of his opponents was Martin Chemnitz (q.v.). A seemingly amicable arrangement between the disputants was brought about by Duke Albert in 1551; but the strife was soon recommenced, Osiander publishing new writings in which he attacked Melanchthon; nor did his death in Königsberg, October 17, 1552, put a stop to the war of words. It was continued by his followers, called *Osiandrists*, who were finally extinguished by the *Corpus Doctrinæ Prutenicum* (in 1567), which caused their banishment from all parts of Prussia. The leader of the party, the Court preacher Johannes Funck, Osiander's son-in-law, was beheaded (1566). Consult the *Life of Osiander*, by Möller (Elberfeld, 1870).

OSIER (OF., Fr. *osier*, from Gk. *οἶσος, oisos, οἴσυον, oisyon, οἴσυα, oisya*, sort of osier; connected with Gk. *ιτέα, itea*, Lat. *vitex*, withy, *vitis*, vine, OPruss. *vitro*, OHG. *weda*, Ger. *Weide*, AS. *wīpig*, Eng. *withy*). The popular name of the bushy willows used for making wicker-work. Their long and slender branches are valuable in proportion to their length, slenderness, suppleness, and toughness. The common osier (*Salix viminalis*), a European species common in wet alluvial grounds, sometimes becomes a tree, although when cultivated for hoops and basket-making it is not permitted to do so. It is often planted to prevent the washing of river banks. It has several cultivated varieties much more useful than the original or wild species, which are apt to break, and therefore are of little value. More suitable for the fine kinds of basket-making are *Salix purpurea*, sometimes called the fine basket osier, and a variety known as the green-leaved osier or ornard, and *Salix triandra*, known to English osier cultivators and basket-makers as the Spaniard rod. *Salix alba*, which sometimes becomes a tree, is the golden osier or golden willow, remarkable for the bright yellow of its branches, as well as for their pliancy and toughness. There are other species, such as *Salix caprea*, *Salix lucida*, and *Salix fragilis*, which are also valuable; but the osiers chiefly cultivated belong to the species which have been named, or are very nearly allied to them. Since some of the European species do not stand the American climate very well, *Salix sericea*, *Salix petiolaris*, *Salix lasiandra*, and *Salix lævigata*,

all American species, are recommended for growing in the United States.

Osiers are extensively cultivated on alluvial soils, especially on the tide-flooded river basins of Holland, Belgium, and France, whence large quantities of rods are exported. Much depends on the closeness of planting, as when space is too abundant the shoots of many of the kinds branch more than is desirable. When osiers for the finest kinds of basket-work are desired, single-eye cuttings are planted close together, so as to obtain weak but fine shoots. For ordinary work, cuttings 15 to 16 inches long and of tolerably thick branches are planted in rows from 18 inches to two feet apart, and at distances of 15 to 18 inches in the row. Osier plantations in light soils continue productive for 15 or 20 years, and much longer in rich, alluvial soils. Clay soils are unsuitable. Usually no cultivation is required after planting, although shallow cultivation is recommended to keep down the weeds. The shoots are cut once a year, during the resting period. They are then sorted, and those intended for brown baskets are dried and stacked, out of danger of rain, care being also taken to prevent heating, to which, like hay, they are liable, and by which they would be rendered worthless. Osiers intended for white baskets cannot at once be peeled; but after being sorted, they are tied in bundles, placed upright in wide shallow trenches or rivulets in which there is about four inches of water, till they begin to bud and blossom in spring. They are then, in ordinary seasons, easily peeled by drawing them through an instrument called a 'break,' but in cold seasons it is sometimes necessary to lay them for a while under a quantity of litter. They may also be peeled by steaming or boiling the dried shoots. There are extensive plantations in the vicinity of Rochester and Liverpool, New York; Detroit, Michigan; Milwaukee, Wisconsin; Cincinnati, Ohio; and Baltimore, Md. In 1890 there was produced in the United States willow ware valued at $3,630,000, an increase of 61 per cent. over the production of 1880.

OSIMO, ō'zē-mō. A town of Central Italy in the Province of Ancona, situated eight miles south of Ancona (Map: Italy, H 4). It has a cathedral, a bishop's palace, a museum containing many statues and ancient inscriptions, and a library. The chief industry is silk-spinning. Osimo is the ancient *Auximum*, founded by the Romans in B.C. 157. Population (commune), in 1881, 17,346; in 1901, 18,529.

OSI'RIS (Lat., from Gk. Ὄσιρις, from Egypt. *Hesri, Ausar, Asiri*). One of the principal Egyptian deities, originally the local god of Abydos and Busiris, who early acquired a solar character and was identified with the setting sun. He thus came to be regarded as the ruler of the realm of the dead in the mysterious region below the western horizon. According to the legend, Osiris was the son of Seb (the earth) and Nût (the sky), and the husband of his sister Isis. When he came to rule over Egypt he found the people plunged in utter barbarism and raised them from their wretched condition by giving them laws, teaching them to till the ground, and instructing them in the worship of the gods. He then traveled over the whole world, spreading the blessings of civilization in every land. His wicked brother Set (Typhon), the enemy of all good, would have taken advantage of his absence to undo his work and subvert the order he had established, but was defeated by the watchfulness of Isis. When the King returned, however, Set plotted to destroy him by treachery. Having privily taken the measure of Osiris's body, he made a beautiful chest of like dimensions and brought it with him to a great feast, at which Osiris was present. As though in jest, he promised to give the chest to any one whose body should fit it exactly. After a number of the guests had tried in vain, Osiris got into the chest and lay down, when Set and his confederates quickly shut the lid and fastened it securely. They then cast it into the river, and it was borne out to sea by the Tanitic mouth of the Nile. Isis, after long wanderings, found her husband's body and brought it back to Egypt, but while she went to visit her young son Horus, it was discovered by Set, who tore it to pieces and scattered the fragments far and wide. Upon learning of this misfortune, Isis took a boat and carefully sought out the scattered members of her husband. Wherever she found a portion of the body, she buried it, and the spot was ever thereafter revered as sacred ground. When Horus grew up, he took vengeance upon the murderer, Set, and ascended his father's throne. Osiris, meantime, lived again in the under world and became the ruler of the dead. At a very early period the worship of Osiris was connected with the Egyptian doctrine of the immortality of the soul and became popular throughout Egypt. Abydos, where the head of the god was believed to be preserved, enjoyed the reputation of special sanctity, and bodies were brought from all parts of Egypt for burial in its sacred soil. Osiris is usually represented swathed in mummy cloths, holding in his hands the crook and the flail, symbols of royalty, and wearing upon his head the *Atef* crown, which was formed of the tall crown of Upper Egypt with a long feather on each side. Consult: Wiedemann, *Religion of the Ancient Egyptians* (New York, 1897); Erman, *Life in Ancient Egypt* (London, 1894). See also Isis; Horus; Serapis; Set; and the paragraph on *Religion* in the section on *Ancient Egypt*, and Plate of Egyptian Deities, under the title Egypt.

OSKALOOSA, ŏs'kȧ-lo͞o'sȧ. A city and the county-seat of Mahaska County, Ia., 60 miles southeast of Des Moines; on the Burlington Route, the Chicago, Rock Island and Pacific, and the Iowa Central railroads (Map: Iowa, E 3). It is the seat of Oskaloosa College (Christian) and Penn College (Friends), opened in 1873, and has a public library, and a United States Government post office building, erected at a cost of $65,000. The yearly meetings of the Society of Friends in Iowa are held here. The industrial interests of the city are represented by manufactures of wagons, steam and hot-water heaters, flour, packed meat, woolen goods, vitrified brick, and iron and brass goods. In the vicinity are deposits of coal, which is extensively mined, besides fire clay and limestone. There are also large agricultural and stock-raising interests. Settled in 1843, Oskaloosa was incorporated ten years later. The government is administered under a revised charter of 1885, which provides for a mayor, chosen every two years, and a council. Population, in 1890, 6558; in 1900, 9212.

OSLER, ŏs'lẽr, William (1849—). An American physician and author. He was born at

Bondhead, Ontario, was educated at Trinity University, Toronto, and at the medical faculty of McGill University, Montreal, where he graduated in 1872. He also studied at University College, London, England, and at Berlin and Vienna. In 1874 he returned to Canada and was appointed professor of physiology and pathology in McGill University; ten years afterwards he was called to the chair of clinical medicine in the University of Pennsylvania. In 1889 he was made professor of the principles and practice of medicine in Johns Hopkins University and chief physician to the Johns Hopkins Hospital. His chief publications include: *Clinical Notes on Smallpox* (1876); *Histology Notes* (1882); *Cerebral Palsies of Children* (1889); and *The Principles and Practice of Medicine* (1892 et seq.).

OSMAN, ŏs-män′. Founder of the Ottoman Empire. See OTHMAN.

OSMAN DIGNA, dig′nȧ (c.1836—). A follower of the Mahdi in the Sudan. He was born, according to some, at Suakin, while others give his birthplace as Rouen, France, and his father as a Scotchman named Nisbet. According to this latter account, the family moved to Alexandria, in 1849, where the father soon died, and the widow married a Turk named Osman, who adopted young Nisbet and called him Osman Ali. They went to Suakin and engaged in the slave trade. Osman continuing the traffic after the death of his stepfather. His business of slave-selling being broken up by the English, he took part in the revolt of Arabi Pasha (q.v.), and after the failure of that movement he attached himself to the cause of the Mahdi. About this time he received the name Digna because of the fullness of his beard; also the title of the 'Emir of the Dervishes of God.' He maintained himself at the head of a powerful army around Suakin and inflicted a severe defeat on Baker Pasha near Tokar, southeast of that place, on February 4, 1884. Immediately after this victory, however, he was defeated by General Graham near Tokar and at Tamanieb. As the Mahdi's ablest general he was largely responsible for the fate of Gordon and the loss of the Sudan to the English. In December, 1888, he suffered a bloody reverse at the hands of General Grenfell, but nevertheless continued his raiding expeditions in the Sudan. In 1899 he fought in the last campaign of the Mahdist forces, whose strength had been broken the previous year at Omdurman. On January 19, 1900, he was captured near Tokar and sent a prisoner to Rosetta.

OSMANIE, ŏs-mä′nē-ȧ, ORDER OF. A Turkish order conferred for conspicuous service to the State. It was established by Abd-ul-Aziz on his accession to the throne in 1861, and has four classes. The decoration is a green-enameled gold star with six points, suspended by the star and crescent from a green ribbon with red bands. In the centre of the star is a crescent on a red background.

OSMAN′LIS. See TURKEY.

OSMAN NURI PASHA, ŏs-män′ nōō′rē pȧ′shȧ′ (1837-1900). A Turkish general, called Ghazi (the victorious). He was born at Amasia, in Asia Minor. He was educated for the army at the Turkish military academy, became a subaltern officer in 1854, and fought in the Crimean War. He took part in the suppression of the rebellion of the Druses (1860), and in that of the Cretan insurrection of 1866-68. He was made a general of brigade in 1874, and in the following year a general of division. When Servia made war upon the Ottoman Empire in 1876, he was put in command of a corps of 35,000 men at Widin, and his successes won him the rank of marshal. In July, 1877, he took up a strongly fortified position at Plevna, thus arresting the advance of the Russians. He inflicted a severe defeat upon them on July 30th, and successfully withstood a desperate assault made by them and their Rumanian allies on September 11th. He held his position until his supplies failed him, and at last on December 10th made a gallant effort to break through the enemies' lines. Overpowered by superior numbers, he was forced to surrender. He was taken to Russia as a prisoner of war, but after the Treaty of San Stefano (1878) returned to Constantinople and became commander-in-chief of the Imperial Guard. He was Minister of War, 1878-85, and Grand Marshal of the Palace till his death, which occurred at Constantinople, April 4, 1900. Consult Levaux, *Ghazi Osman Pacha* (Paris, 1891). See RUSSO-TURKISH WAR.

OSMIUM (Neo-Lat., from Gk. *ὀσμή, osmē, ὀδμή, odmē*, odor, from *ὄζειν, ozein*, to smell). A metallic element discovered by Tennant in 1803. It is one of the platinum metals, and is found native alloyed with rhodium, ruthenium, and palladium. When *osmiridium*, which is found as a hard, crystalline substance (insoluble in aqua regia) in platinum ores, is heated to a white heat in porcelain tubes in a current of air, the volatile oxide of osmium (OsO_4) readily sublimes over. Metallic osmium may be obtained from the oxide by reducing the latter with hydrogen, carbonic oxide, or carbon.

Osmium (symbol, Os; atomic weight, 191) is a lustrous, blue-white metal with a specific gravity varying between 20 and 22.5. It is extremely difficult to fuse, much more so than platinum and iridium. Its compounds with oxygen include a monoxide (OsO), a sesquioxide (Os_2O_3), a dioxide (OsO_2), and the tetroxide (OsO_4) mentioned above. The tetroxide is the only one of the oxides that is volatile. Osmic acid, H_2OsO_4, has been obtained in the free state by the decomposition of its potassium salt (potassium osmate, K_2OsO_4) with water and precipitating with alcohol in a current of hydrogen.

OSMO′SIS (Neo-Lat., from Gk. *ὠσμος, ōsmos*, impulsion, from *ὠθεῖν, ōthein*, to push). This phenomenon, which is discussed in its fundamental form and from the physical point of view under SOLUTION, plays an important part in plant physiology. The plant cell, consisting of a mass of protoplasm, surrounded by a somewhat tough but flexible and elastic membrane, the cell wall, and inclosing a watery fluid, the cell sap, is an appropriate mechanism for an effective display of osmotic phenomena, which are fundamental to three important functions: (1) turgor (q.v.), (2) absorption and transfer of water, (3) absorption and transfer of dissolved substances. (See ABSORPTION IN PLANTS.) The general principles set forth under SOLUTION may be summarized with respect to plants as follows: (1) Dissolved substances diffuse to the limits of the solvent and exert an osmotic pressure [illegible] to gas pressure and manifesting the same [illegible]

(b) The osmotic pressure of several non-reacting substances in solution together equals the sum of the pressures of each solute upon the given volume of solvent. (c) Osmotic pressure may be made evident by interposing a membrane between solutions of unequal pressure, the solvent freely passing, while the solutes are hindered or prevented. (d) In plants water is the sole solvent. The plant cell is an osmotic apparatus. The cell wall is ordinarily permeable to both solvent and solutes, but the protoplasm is a semi-permeable membrane with respect to many solutes. Under normal conditions, therefore, when water is available, it enters the cell and allows the osmotic pressure of the solutes to manifest itself in pushing the protoplasmic membrane against the cell wall until the elastic resistance of the wall balances the pressure. A cell with wall distended is said to be turgid. The presence of solutes in the water within the semi-permeable membrane of protoplasm in the surface cells of the root demands the entrance of water from the outside until an equilibrium is reached. But the attainment or maintenance of equilibrium is constantly prevented by the evaporation of water from surfaces exposed to the air; for when water evaporates from a cell the elastic resistance of the cell wall is no longer equal to the osmotic pressure and water enters from a neighboring cell, and so on, corresponding action making possible the movement of water from more and more remote cells until the turgor is equalized by the entrance of water from without. (See CONDUCTION.) The absorption of solutes from water in contact with the plant is independent of the movement of water. If by removal from the cell sap, either by use or by transformation, the osmotic partial pressure of any solute within the cell be diminished, other molecules of this solute may gain entrance. Provided the protoplasm be permeable to it, the entrance of any solute depends on a disturbance of the equilibrium between the osmotic partial pressure of that substance inside and outside the cell.

Since the osmotic pressure of solutions of acids and salts (electrolytes) is greatly increased by their electrolytic dissociation (see DISSOCIATION), which occurs in watery solutions, this must be an important factor in plant life. Normally all the solutions surrounding the plant are dilute watery solutions in which the extent of such dissociation is considerable. The solutions within the plant cell, too, contain solutes in a state of electrolytic dissociation. In considering the osmotic phenomena within the plant, therefore, allowance must be made for the increase of osmotic pressure due to electrolytic dissociation.

OS'MUN, THOMAS EMBLEY, best known by his pseudonym, 'Alfred Ayres' (1834-1902). An American orthoëpist and critic. He was born in Montrose, Summit County, Ohio, and was educated at an academy in Cleveland, Ohio, at Oberlin College, and in Paris and Berlin, where he spent six years. Returning to America in 1859, he settled in New York, where he engaged in newspaper and magazine work and became well known as a dramatic critic. His extensive writings on orthoëpy and elocution were exceedingly popular, and so widely read as to give rise to the claim made for him by some that he had done more to better the condition of written and spoken English in America than any other man in his generation. In 1891-94 he was employed on the staff of the *Standard Dictionary*. Among his published works are: *The Orthoëpist* (1880); *The Verbalist* (1881); *The Mentor* (1884); *The Essentials of Elocution* (1886); *Acting and Actors* (1894); *Some Ill-used Words* (1901).

OSMUNDA (ML., water fern). A genus of ferns, distinguished by spore-cases in branched, stalked masses. The osmunda royal, royal or flowering fern (*Osmunda regalis*), is the noblest and most striking of North American ferns, found also in many parts of Europe. It has bipinnate fronds, and panicled spore-cases upon altered fronds, which appear as distinct stalks and simulate the general appearance of a phanerogamous plant. The sterile fronds sometimes rise to 5 feet in height. Its rootstocks were formerly employed in scrofula. The rootstocks abound in a mucilaginous substance, which is used in Northern Europe instead of starch. The cinnamon fern (*Osmunda cinnamomea*), another common North American species, is clothed with rusty wool when young, hence the name. *Osmunda claytoniana*, another American species common in low ground, has fertile fronds 2 to 4 feet in height.

OSNABRÜCK, ŏs'nä-brŭk (formerly called Osnaburg by English writers). An ancient town in the Province of Hanover, Prussia, situated on the Hase, about 30 miles northeast of Münster (Map: Prussia, B 2). It consists of the old, irregular town, surrounded by promenades laid out on the site of the ancient fortifications, and the new quarters regularly laid out and containing a number of handsome buildings. The Catholic cathedral is a partly Romanesque and partly Transitional building of the thirteenth century surmounted by three towers. The Gothic Marienkirche dates mainly from the fifteenth century and is of architectural merit. Among other noteworthy buildings is the Rathaus (fifteenth century), where the preliminary negotiations for the Peace of Westphalia were carried on.

The educational institutions comprise two gymnasia (of which one, the Gymnasium Carolinum, was founded by Charlemagne), a seminary for priests, two teachers' seminaries, a theatre, and a valuable museum. Industrially Osnabrück is among the most important towns of Hanover. It has extensive iron foundries, and manufactures various kinds of machinery, boilers, pipes, wire, nails, pianos, organs, rugs, cotton goods, paper, brick, tobacco, etc. In the vicinity are stone quarries and coal mines. The trade is important in local manufactures and agricultural and animal products. Population, in 1890, 39,900; in 1900, 51,574, including over 15,000 Roman Catholics.

Osnabrück received mint, market, and custom privileges as early as 888, and was surrounded with walls in 1082. Although constituting a part of the Bishopric of Osnabrück, founded by Charlemagne at the end of the eighth century, it enjoyed practical independence, and became a member of the Hanseatic League. In accordance with the provisions of the Peace of Westphalia, the Bishopric of Osnabrück was held alternately by Roman Catholics and Protestants until its secularization in 1803. In 1857 the Roman Catholic bishopric was reëstablished. Consult: Mithoff, *Kunstdenkmäler und Altertümer im Hannoverschen*, vol. vi. (Hanover, 1879); *Osnabrücker Geschichtsquellen*, edited by the His-

torischer Verein von Osnabrück (Osnabrück, 1891 et seq.); Würm, *Osnabruck, seine Geschichte*, etc. (ib., 1901).

OSORIO, ô-sō'rê-ō, Manoel Luiz (1808-79). A Brazilian general, born in Rio Grande do Sul, near Pelotas. In the civil war of 1839 to 1845 in his native province, he won his spurs; then served bravely in the Uruguayan campaign of 1851-52, and from 1865 to 1869, when he was disabled in action, took a prominent part in the war with Paraguay. During this war he was commander-in-chief (1865-66), and in 1867 was made lieutenant-general. Osorio entered politics, became Senator in 1877, and from 1878 to his death was Minister of War, but his great fame was as the brave and dashing cavalry leader who won from his soldiers the title of 'The Fabulous' (*O legendario*).

OSPREY (from OF. *orfraie*, from Lat. *ossifragus*, osprey, bone-breaker, from *os*, bone + *frangere*, to break), or Fish-Hawk. An accipitrine bird, which represents the genus Pandion and family Pandionidæ, and differs from the ordinary falcons in the reversible, owl-like outer toe, the lack of an aftershaft to the feathers, the long, closely feathered tibiæ, and other structural details, and in its habit of feeding exclusively on live fish, caught from the water. The osprey is cosmopolitan, except in some oceanic islands, but is everywhere local, as it is not able to live far from the shores of bodies of water or large rivers. The typical form is that of the Old World (*Pandion haliëtus*), of which the American fish-hawk and an Australian 'fishing eagle' are regarded as geographical races.

Our American fish-hawk is about two feet long. It is of a dark-brown color, variegated with white, gray, and black; the under parts are white except a light brown band across the breast. The bill is short, strong, broad, and very strongly hooked. The tail is rather long and the wings are very long. The soles of the feet are very rough and covered with small pointed scales which enable it to secure a firmer hold on its slippery prey, which it seizes with its talons alone and bears away to its nest or to a perch. It is often robbed of its gains by the bald eagle, which loves fish, but is unskillful in catching them.

The nest of the fish-hawk is a huge, stick-built affair (a load for a cart) placed on a sea-fronting cliff or in a tree—in the United States usually the latter; and the same structure may be repaired and reoccupied for many seasons. In favorable places colonies of fish-hawks may nest in company; and they have occasionally nested upon platforms placed upon tall poles for their accommodation. Another feature of interest is that other birds—notably the American grakles—often build their nests in the outer interstices of the osprey's rough structure, and dwell there undisturbed. The eggs (two to four) are white, blotched with claret-brown, purplish, and ochre. Excellent accounts of the fish-hawk are given in the books of Wilson, Nuttall, Audubon, and other of the older ornithologists, as well as in modern treatises on birds. See Plate of Eagles and Hawks.

OSSA (Lat., from Gk. Ὄσσα). The ancient name of a mountain in Northeastern Thessaly, separated from Olympus by the vale of Tempe. It is now called Kissavos. The conical summit is 6398 feet high. According to Homer, the young giants, Otus and Ephialtes, planned to pile Ossa on Olympus and Pelion on Ossa in order to reach heaven.

OSSEIN, ŏs'sē-in (from Lat. *os*, bone). A substance allied to gelatin and forming the organic part of bones. It is obtained by the prolonged action of dilute hydrochloric acid on bone, which dissolves all the inorganic matter. The material thus obtained retains the form of the bone without its hardness, and must be repeatedly washed with water, and treated with alcohol and ether to remove traces of salts, fat, etc. It is insoluble in water, but is converted into gelatin by the action of boiling water—a transformation which is much facilitated if a little acid be present. The ossein yielded by different kinds of animals requires different times for its conversion into gelatin, and that of young animals changes more rapidly than that of adults of the same species.

OSSETES, ŏs-sēts'. A people of the Kazbek region in the Central Caucasus. The Ossetes seem to be somewhat above the average in stature, with subbrachycephalic head-form, and largely without the prepossessing physical characters of some of the other peoples of the Caucasus. Ripley (1899) is inclined to regard the Ossetes as immigrants from the direction of Iran; their own tradition brings them from the region of the Don in Southeastern Russia. The Ossetes call themselves Iron, which has been identified with Iran (Eran). (See Ossetic Language.) Their religion is a mixture of Christianity and Islam. Family life is strong, but the married woman (though girls are consulted for marriage) has a rather servile position. Detailed information about the Ossetes will be found in Haxthausen, *Transcaucasia* (London, 1854); Von Erckert, *Der Kaukasus und seine Völker* (Leipzig, 1887); Chantre, *Recherches anthropologiques dans le Caucase* (Paris, 1885-87); and Kovalevski, "The Customs of the Ossetes," in the *Journal of the Royal Asiatic Society* for 1888. See Ossetic Language.

OSSE'TIC LANGUAGE. A modern Iranian language spoken in the central part of the Caucasus. In its phonology it resembles Armenian (q.v.) in many respects, but these similarities are to be regarded as accidental coincidences. In structure the language, like the other modern Indo-Iranian vernaculars, is analytic in type. The noun has ten cases, formed by postpositions (e.g. *lag*, 'man,' *laga*, 'to the man,' *laji*, 'of the man,' *lajima*, 'with the man,' while the plural *lagta*, 'men,' has the corresponding forms *lagtan*, *lagtj*, *lagtima*). The verb has three tenses, present, preterite, and future, and four modes, indicative, imperative, optative, and subjunctive. Compound tenses and a passive voice are formed, as in many other languages, by the participles and the verb *ŭnm*, 'to be' (e.g. *nudistāt*, 'ye were cursed'). Ossetish has two main dialects, Tagaurish, Ironish, or Irish in the northeast, with a subdialect Tualish in the south, and Digorish or Dugorish in the northwest. By far the most important linguistically is Tagaurish. The Ossetish has but a scanty literature, although rich in folk tales. The Psalms and most of the New Testament have been translated into it. The Russian alphabet is often employed, although the Armenian is the

more common. Consult: Spögren, *Ossetische Sprachlehre* (Saint Petersburg, 1844); Rosen, *Ossetische Sprachlehre* (Lemgo, 1846); Konkadze and Konayevym, *Osetinskoje teksty* (ed. by Schiefner, Saint Petersburg, 1868); Miller, *Osetinskije etyudy* (Moscow, 1881-87); id., *Digorskoi skazanniia* (ib., 1902); Stackelberg, *Beitrage zur Syntax des Ossetischen* (Strassburg, 1886); Hübschmann, *Etymologie und Lautlehre der Ossetischen Sprache* (ib., 1887).

OS'SETT. A municipal borough in Yorkshire, England, on the Calder, 3½ miles west of Wakefield (Map: England, E 3). Its staple industry is the manufacture of woolens. Coal is extensively mined in the neighborhood. The town owns its water supply and maintains a free library, technical school, and sewage works. It has a mechanics' institute. Population, in 1891, 11,100; in 1901, 12,300.

OS'SIAN, more correctly **OISÍN**, or **OSSÍN.** A legendary character of Irish literature, whose exploits are connected with historical events of the last days of heathendom in Ireland. As time went on poems about Ossin spread over Ireland and Scotland. The whole cycle underwent changes in individual poems. The tradition was embellished, and more and more it grew to resemble fairy lore. According to the evidence of these largely fragmentary or late poems and of the prose romances, Ossin belongs to the third century A.D. and to Ireland. King Cormac MacArt had a son-in-law Finn (or Fionn), who commanded the Fianna or Fenians, a sort of praetorian guard of the royal chieftain, among whom were Finn's son Ossin, his grandson Oscar, and another grandson Caoilte (or Caillte). Cormac is said to have died in 266. His successor, Carbery, thought the Fenians a danger to his throne. Civil war arose. Carbery slew Oscar. The Fenians were crushed in 293 at the battle of Gabhra. Ossin and his cousin Caoilte fled, and we find them, only 150 years later, in the company of Saint Patrick, through whose ministrations they die baptized, according to some forms of the legend. The "Story of Ossin in the Land of the Young" makes him pass long years in fairyland. It is possible to distinguish three periods in the Ossin cycle: (1) The ancient, recorded in fragments older than the twelfth century, of which there may be altogether some 100. (2) The mediæval, containing documents chiefly of the twelfth century, of which the most important is the *Agallamh na Senorach* or *Colloquy of the Elders*, a chaos of local legends, of prose and verse, the latter apparently the more ancient, and bearing somewhat the relation to the former, in diction, that the *Elder Edda* does to the *Younger*. The work of this period is more patriotic, chauvinistic even, than are the ancient fragments. It expresses hatred for the foreigner, under the guise of Fenian opposition to the Lochlannach. Another noteworthy characteristic is that woodcraft plays a greater part and there is more appreciation of nature than earlier. (3) The post-mediæval Ossinic documents are mainly in verse. The wilder forms of nature become prominent in them, and many of the songs are defiantly and dramatically pagan, as though in scorn of the sour fanaticism of Patrick, who is quite transformed from the genial saint of the earlier period. The first examples of the cycle in this stage are to be found in Dean McGregor's *Book of Lismore*, a compilation of 1518, or perhaps earlier. But Irish and Scotch tales of Ossin and the Fenians continued to be sung and told in the seventeenth, eighteenth, and even in the nineteenth century. The last deliberate contribution to the Ossin cycle was Michael Comyns's *Oisin in Tir na N-Og*, which, as it was written about 1750, is by an odd coincidence almost exactly contemporary with Macpherson's (q.v.) dislocated mosaic of phrases from Ossinic poems coupled with those of other cycles and set in a modern and rather cheap paste, which he published as "Ossian." Yet the reaction against Macpherson's poems has been too strong. In Macpherson's work landscape plays a very great part; in the Ossin cycle a very small one. It may be noted too that Macpherson confounds heroes of the cycle of Cuchullin with the Fenians and makes both contemporaries of the Northmen of the eighth century. (See MACPHERSON.) It is doubtful if any fragment of verse by Ossin remains. Poems are first attributed to him in twelfth-century manuscripts. Indeed, the origin, authorship, date, historical background, and even the existence of the hero, are all matters of uncertainty and debate. Consult: Ossianic Society publications (Dublin, 1854-61); Simpson, *Poems of Ossian* (London, 1857); J. F. Campbell, *Popular Tales of the West Highlands, Orally Collected, with a Translation* (ib., 1860-62); Mac Lauchlan, *The Book of the Dean of Lismore* (ib., 1862); Clerk, *The Poems of Ossian, with a Dissertation and Translation* (ib., 1870); Campbell, *Leabhar na Feinne* (ib., 1871); *Academy* for 1873—letters by Hennessy; Windisch, *Die altirische Sage und die Ossianischen Gedichte* (Leipzig, 1878); Windisch, *Irische Texte* (Leipzig, 1881-1900); Arbois de Jubainville, *La littérature ancienne d'Irlande et l'Ossian de Macpherson* (Paris, 1880); K. Meyer, *Cath Finntraga, or the Battle of Ventry* (Oxford, 1885); Campbell, *Fians* (London, 1891); O'Grady, *Silva Gadelica* (London, 1892), and *Silva Celtica* (London, 1895); Texte, *J. J. Rousseau et les origines du cosmopolitisme littéraire au XVIIIe siècle* (Paris, 1895, translated London, 1899); Nutt, *Ossian and the Ossianic Literature* (London, 1899); also the *Revue Celtique* (Paris, 1870 et seq.). See MACPHERSON, JAMES.

OSSIFICATION (from Lat. *os*, bone + *facere*, to make). The vital process by which calcareous matter is deposited in cartilage or membrane, giving rise to bone. At a very early period of embryonic life, as soon as any structural differences can be detected, the material from which the bones are to be formed becomes mapped out as a soft gelatinous substance, which may be distinguished from the other tissues by being rather less transparent, and soon becoming decidedly opaque. From this beginning the bones are formed in two ways: either the tissue just described becomes converted into cartilage, which is afterwards replaced by bone (*intracartilaginous ossification*), or a germinal membrane is formed, in which the ossifying process takes place (*intramembranous ossification*). The latter is the more simple and rapid mode of forming bone. When ossification commences, the membrane becomes more opaque, and exhibits a decided fibrous character, the fibres being arranged more or less in a reticulated manner. These fibres become more distinct and granular from impregnation with lime salts, and are converted into incipient bone, while the cells which are

scattered among them shoot out into the bone corpuscles, from which the canaliculi are extended, probably by resorption. The facial and cranial bones, with the exception of those at the base of the skull, are formed without the intervention of any cartilage.

In intracartilaginous ossification, at the point where ossification begins the cartilage cells arrange themselves into rows, and become separated by the growth of the matrix in which they lie. A deposit of calcareous material now takes place between the rows of cartilaginous cells, and the cartilage assumes a granular and opaque appearance. While this process is going on in the centre, a thin layer of bone is being formed between the surface of the cartilage and the vascular membrane covering it—the periosteum—by the agency of cells called osteoblasts, in much the same way that intramembranous ossification takes place. From this outer shell prolongations consisting of osteoblasts and blood-vessels penetrate toward the centre of the cartilage and form the permanent canals through which the bone is nourished. All the bones of the body except those of the face and the vault of the cranium are formed in cartilage. Certain bones at the base of the skull, as the occipital, are formed partly in cartilage and partly in membrane.

True ossification sometimes occurs as a pathological process; but in many cases the term is incorrectly used (especially in the case of blood-vessels) to designate a hard calcareous deposit, in which the characteristic microscopic appearances of true bone are absent. The osseous tissue that is formed in regeneration of destroyed or fractured bones may be regarded as due to a morbid, although a restorative action. Hypertrophy of bone is by no means rare, being sometimes local, forming a protuberance on the external surface, in which case it is termed an *exostosis*, and sometimes extending over the whole bone or over several bones, giving rise to the condition known as *hyperostosis*. Again, true osseous tissue occasionally occurs in parts in which, in the normal condition, no bone existed, as in the dura mater, in the so-called permanent cartilages (as those of the larynx, ribs, etc.), in the tendons of certain muscles, and in certain tumors. The causes of these osseous formations are not known.

OS'SINING (formerly Sing Sing). A village in Westchester County, N. Y., 31 miles north of New York City; on the east bank of the Hudson River, and on the New York Central and Hudson River Railroad (Map: New York, G 4). It is a popular residential place, beautifully situated at the widest part of the Hudson, Tappan Bay, and commanding from its elevated site fine views. It has a public library, several private boarding schools, and a soldiers' monument. The arch of the Croton Aqueduct, 88 feet in span and 70 feet above water, with a subjacent arched highway bridge, is an interesting feature. The Sing Sing State Prison, located here, is one of the most prominent in the United States. There are extensive manufactures of machinery, foundry products, porous plasters, pills, shoes and leather, etc. Under a revised charter of 1897 the government is vested in an annually elected president and board of trustees. There are municipal waterworks. Population, in 1900, 7939. Settled about 1700 on part of the Philipse Manor, Sing Sing, named probably from the Sin Sincks Indians, was incorporated as a village in 1813. In 1901 the name was changed to Ossining after several attempts had been made, the former name having become objectionable owing to its association with the prison. Consult Scharf, *History of Westchester County* (Philadelphia, 1886).

OS'SOLI, Marchioness. See Fuller, Sarah Margaret.

OSTADE, ōs'tä-de, Adriaen van (1610-85). One of the greatest of Dutch genre painters, he was born at Haarlem, December 10, 1610, and was a pupil of Frans Hals. He was, however, more influenced by his fellow-pupil Brouwer, in whose manner he painted tavern scenes from peasant life, during what may be called his first manner, which lasted till about 1640. He endeavored to render the artistic effect of the whole, giving little detail, and even caricaturing Brouwer's types. His second manner is characterized by chiaroscuro effects, which show, especially in his interiors, the influence of Rembrandt. The element of the landscape also enters his art, which had heretofore been confined to interiors. From 1650 to 1670 he was at the height of his powers, after which his pictures become cooler in tone, though the colors are brighter, and the execution is more detailed. He lived in prosperous circumstances, having been dean of the Painters' Guild and a member of the civic guard. He died at Haarlem, April 27, 1685.

Over five hundred of his paintings survive, of which there are numerous examples in the galleries of Northern Europe. Of the paintings of his first period, representing tavern scenes, there are good specimens in the private galleries of Vienna and Cassel, and in the public collections of Munich and Dresden. Among the works of his best period are the "Hurdy-Gurdy Man Before a Peasant's Cottage" (1640) and "Peasant Company," in the Berlin Museum; "Interior of a Cottage," (1642), "The Village School," and "The Schoolmaster," in the Louvre; "A Tavern Scene" (1660), "Peasants Smoking," "The Painter in His Studio," and others in the Dresden Gallery; and a number of excellent examples in Buckingham Palace, London. To his best period also belong a number of admirable single genre figures like the "Baker," "Fiddler," "Hurdy-Gurdy Man," and the three "Senses," at Saint Petersburg; the "Merchant," and "Man Reading," in the Louvre; "The Smoker" (Antwerp), and the "Herring Eater" (Brussels); and a fine portrait group wrongly supposed to be the painter and his family, in the Louvre. There are good examples of his later period at Amsterdam, The Hague, Cassel, and Dresden. Ostade was also an etcher of some distinction, having left about 50 plates treating of peasant subjects, most of them dated 1646 and 1647, a period at which he was under the influence of Rembrandt.

Consult: Van der Willigen, *Les artistes de Haarlem* (The Hague, 1870), and the biographies by Gaedertz (Lübeck, 1869), and Lemcke, in Dohme, *Kunst und Künstler* (Leipzig, 1878); also Bode, *Adriaen van Ostade als Zeichner und Maler* (Vienna, 1881); Van der Wiele, *Les frères van Ostade* (Paris, 1893); Rosenberg, *Adriaen und Isaak van Ostade* (Bielefeld, 1900); Springer, *Das radierte Werk von Adriaen van Ostade* (Berlin, 1899).

OSTADE, Isaak van (1621-49). A Dutch landscape and genre painter. He was born at

Haarlem, and was a younger brother and the principal pupil of Adriaen van Ostade, from whose works it is difficult to distinguish his early genre paintings, which are not signed. He soon developed an independent style, the chief characteristics of which are warmth and harmony of color and an admirable impasto, his best productions comparing favorably with his brother's. He left about 120 paintings, most of which are in private possession in England. In his independent paintings one of his favorite subjects is traveling parties, consisting of men and horses, resting before a tavern, in which the theme is always varied, the charming landscape being the most attractive feature. Of this subject there are five examples in the galleries of Amsterdam, Buckingham Palace (London), Berlin, the Louvre, and Saint Petersburg. His other chief specialty is winter scenes, represented in fine gray harmonies, in which he usually introduces the frozen canals with the national Dutch amusements of skating and sleighing. Of this variety there are three good examples in the Louvre, and others in the National Gallery, London, and in the Galleries of Antwerp, Saint Petersburg, and Dresden. A third subject, in which the figures rather than the landscapes are the principal part, are groups of peasants sitting in front of taverns or house doors, of which the chief examples are "The Spinner," in the Brussels Museum, and "The Fiddler," in Buckingham Palace. His drawings are no less excellent and carefully executed than his paintings. He died at the height of his power and was buried October 16, 1649, in Haarlem. Consult the authorities referred to under OSTADE, ADRIAEN VAN.

OSTA'RIOPHY'SI (Neo-Lat. nom. pl., from Gk. *ὀστάριον*, *ostarion*, little bone, diminutive *ὀστέον*, *osteon*, bone + *φῦσα*, *physa*, bladder). A group of teleost fishes, which includes the majority of the living fishes of the world. The group is characterized, according to Jordan, by the modification of the anterior vertebræ, which are coössified and have some of their lateral superior elements detached to form a chain of small bones, the Weberian ossicles, which connect the air-bladder with the ear. It is composed of three orders—Nematognathi, Plectospondyli (q.v.), and Scyphophori—which are regarded as descended from a common stock.

OSTASHKOV, ŏs-tăsh'kŏf. A town in the Government of Tver, Russia, on the eastern shore of Lake Seliger, 162 miles northwest of Tver (Map: Russia, D 3). Among its public institutions are a library and a theatre. It is especially known as a tanning centre and has extensive boot-making interests. Other industries are boat-building and the manufacture of hardware and agricultural implements. A steamer service is maintained on the lake, which also affords good fishing facilities. Population, in 1897, 10,457.

OSTEND, ŏs-tĕnd' (Flem. and Fr. *Ostende*). A famous watering place on the North Sea on the west coast of Belgium, in the Province of West Flanders, 14 miles from Bruges (Map: Belgium, A 3). It is the second port in the Kingdom, and is connected by canal with Bruges and Ghent. Ostend is the terminus of branch railway lines connecting with the great Continental systems, and is a station for daily steamers between England and the Continent. The traffic between London and Ostend is immense. In the season from June 1st to October 25th about 50,000 visitors annually flock to the town. It is beautifully laid out as a fashionable summer resort. The elegant Kursaal is the centre of life in the season. The magnificent stone sea wall is lined with splendid hotels. The harbor works are on a fine scale, embracing a number of basins, which are entered by a channel about 100 yards wide. Ostend has a large fishing fleet, and the culture of oysters is carried on in the so-called oyster parks. Ostend endured a memorable siege by the Spanish from 1601 to 1604, when it finally surrendered to Spinola. Population, in 1901, 39,541. Consult Beaucourt de Noortoelde, *Ostende sous Léopold (1865-1900) ou la reine des plages*, vols. i.-ii. (Ostend, 1900).

OSTEND COMPANY. A trading corporation founded by the Emperor Charles VI. in 1722, and chartered by him in the following year. As ruler of the former Spanish Netherlands, it was his ambition to make Ostend a great port on the northern waters, as Trieste was on the Mediterranean, and to obtain for the Empire a share in the lucrative trade with the East Indies; hoping, too, that the merchant marine thus created would become the nucleus of an imperial navy. Preliminary voyages had been made for some years before the establishment of the company, and soon after its incorporation as the Ostend East India Company settlements were founded at Covelong on the southeast coast of India and Bankipur on the Hugli. To further his schemes which, after the confirmation of the Pragmatic Sanction, was his favorite project, the Emperor sought the assistance of Spain, whose coöperation was obtained in the second treaty of Vienna (1725). The maritime powers, especially England and Holland, regarded this intrusion on their trade monopoly with resentment, and the Emperor in the preliminaries of Vienna (May, 1727) was compelled to suspend the operations of the company for seven years, a delay the second treaty of Vienna in 1731 to [illegible] it.

OSTEND MANIFESTO. A dispatch drawn up at Ostend, October 9, 1854, and signed by James Buchanan, John Y. Mason, and Pierre Soulé, at that time the United States Ministers to Great Britain, France, and Spain respectively, declaring that the sale of Cuba would be as advantageous and honorable to Spain as its purchase would be to the United States, but if Spain refused to sell, self-preservation required that it be wrested from her by force. Encouraged by the acquisition of Texas, the pro-slavery leaders had been affording ready assistance to filibustering expeditions directed against the islands of the Spanish West Indies, and especially Cuba. These expeditions and the probable future action of the Federal Government in regard to the island created anxiety in Europe, and in 1852 Great Britain and France addressed a joint note to the United States proposing a tripartite convention by which the three Powers should disclaim all intention to obtain possession of Cuba and should discountenance such attempts by any Power. Everett, then Secretary of State, replied, refusing to accede to such an arrangement, while declaring that this country would never question Spain's title to the island. President Pierce in August, 1854, directed the American ministers resident at London, Paris, and Madrid to meet at some convenient point for discussion of the Cuban question.

They met at Ostend, October 9th, and subsequently at Aix-la-Chapelle, though it was at the former place that the memorandum known as the Ostend Manifesto was prepared.

The declaration was not approved in the United States in the platforms of either party, and it was strongly condemned in Europe. Consult: Cluskey, *Political Text-book* (Philadelphia, 1860); also Wilson, *Rise and Fall of the Slave Power* (Boston, 1872-77).

OSTEN-SACKEN, ōs'ten-säk'ken. Baron CHARLES ROBERT (1828—). A Russian diplomatist and entomologist. He was born August 21, 1828, in Saint Petersburg, where he was educated, and in 1849 entered into the service of the Imperial Foreign Office. In 1856 he was appointed Secretary of Legation in Washington; in 1862 Consul-General of Russia in New York. He resigned his post in 1871, but remained in the United States until 1877, when he went to reside in Heidelberg. He devoted the best years of his life to working up the Diptera (flies) of North America, partly in collaboration with H. Loew, and otherwise exerted an immense influence in extending entomological studies in North America. Besides many papers of a systematic, critical, and historical nature, Baron Osten-Sacken has published two catalogues of North American Diptera, also elaborate monographs on different families of flies.

OSTEOL'EPIS (Neo-Lat., from Gk. ὀστέον, *osteon*, bone + λεπίς, *lepis*, scale). A fossil crossopterygian fish found in the Old Red Sandstone of the Scottish Devonian.

OSTEOLOGY (Gk. ὀστεολογία, from ὀστέον, *osteon*, bone + -λογία, *-logia*, account, from λέγειν, *legein*, to say). The science which treats of the anatomy, development, and relations of bones and bony tissue. See BONE; SKELETON.

OSTEOMALA'CIA (Neo-Lat., from Gk. ὀστέον, *osteon*, bone + μαλακία, *malakia*, softness, from μαλακός, *malakos*, soft). MOLLITIES OSSIUM, or MALACOSTEON. A disease of adult life, characterized by progressive softening of the various parts of the skeleton, with resulting deformities. It is very rarely seen in children or old persons. In the great majority of cases it affects women, chiefly those who have borne children or who are pregnant. It usually progresses from bad to worse, and after perhaps a number of years it causes death, chiefly from exhaustion or complicating disease of the lungs. It has been attributed to the action of many causes, such as defective nutrition, excess of lactic acid, disease of the trophic nerves, ovarian and uterine changes, etc.; in many cases the real exciting cause is uncertain.

The changes in the bony tissue are: Great increase in vascularity, with resulting hemorrhages; then there is degeneration of the medulla or the marrow of the bone, so that it finally becomes converted into a pulp-like substance; then there is destruction of the cancellous or spongy tissue of the bone, so that cavities or tumor-like enlargements result. The periosteum is ordinarily thicker and more vascular than normal, and serves as a protecting envelope to the broken-down bone. Fracture of the bone from no other cause than muscular action or a slight movement is of frequent occurrence, and deformity—sometimes very excessive and peculiar—is sure to be produced in other than the mildest cases.

Until deformity has occurred, or until at least the softening has advanced so far as to permit of the bone being bent, the diagnosis is difficult and uncertain, since the progress of the disease is for a long time an insidious one. Because of the early developed and persistent pain, the affection may be mistaken for rheumatism; but the multiplicity of painful areas, the sex of the patient, the existence of pregnancy, and the presence of large quantities of the salts of lime in the urine should direct suspicion to osteomalacia. Though this disease may not for a time exert any unfavorable influence upon life, the prognosis is grave, for the disease usually ends fatally. However, it occasionally ceases to advance, and it has even been overcome. Medical treatment—the use of phosphorus and the phosphates, the lime salts, cod-liver oil, etc.—has proved of little or no value. The best possible hygienic surroundings should be secured and the patient kept quiet and free from pain. Proper retentive dressing should be applied to prevent fracture and lessen deformity. It is reported that in some cases the removal of the ovaries and uterus has been beneficial. In any event pregnancy should be prevented, as childbearing exerts a powerful and deleterious influence upon the progress of the disease.

OSTEOMYELITIS (Neo-Lat., from Gk. ὀστέον, *osteon*, bone + μυελός, *myelos*, marrow). An inflammation, usually acute, of the marrow of the bone, extending to the bone itself, and due to infection by a pyogenic organism. It may follow a wound which exposes the medullary canal to the air, such as a compound fracture, a gunshot injury, or an amputation; or the infective material may be introduced through the blood. The entire shaft of the bone may be involved. The symptoms are severe aching pain, exquisite tenderness, and deep swelling of the soft parts [illegible] bone. A purulent discharge, containing [illegible] nts of dead bone and tissue—sloughs, makes [illegible] s. [illegible] earance. There is a high fever in severe [illegible] ses with chill and sweats.

Children are subject to an acute form of the disease, which is sometimes called acute epiphysitis because it begins at the epiphyseal line and involves the epiphysis. A strain occurs at this point, and an inflammation ensues. The femur and tibia are the bones oftenest affected, and the knee or hip-joint becomes involved and filled with pus. The disease may sometimes be mistaken for rheumatism.

The treatment of this malady, which is a very fatal one, is purely surgical. The affected bone is to be freely opened, dead bone removed, the medullary canal scraped and washed out with a strong antiseptic, packed with gauze, and drained. Amputation is sometimes necessary. The patient's strength should be supported by nourishing food and stimulants.

OSTEOPATHY (from Gk. ὀστέον, *osteon*, bone + πάθος, *pathos*, suffering, disease). A method of treating disease by manipulation, for which its adherents claim a universal curative power. It was invented by Andrew T. Still, of Kirksville, Mo., in 1893. The underlying principles of osteopathy are briefly as follows: The fluids of the human body contain greater or less amounts of all chemical substances, inorganic and organic, that are at all capable of existence, and hence carry a store of all drugs that may be required for checking and destroying any in-

inable disease; disease itself is nothing but an abnormal effect of the powers of life and presumably arises, along with the normal effect—motion—continually; only, under the influence of the drugs in the body, the activity of those powers is immediately redirected along normal channels, and so disease no sooner arises than it is counteracted and destroyed; the reëstablishment of health can be prevented by only one cause, viz. the slight displacement of some bone, which would naturally form an obstruction to the flow of the drug-carrying fluids; therefore, to effect the cure of any disease whatever, all we have to do is to localize the causative displacement of the bone or bones and remove it by appropriate manipulation. Mr. Riggs, of Boston, a lecturer on osteopathy, defines the methods as follows: "Osteopathy is a method of treating disease by manipulation, the purpose and result of which is to restore the normal condition of nerve control and blood supply to every organ of the body, by removing physical obstruction or by stimulating or inhibiting functional activity, as the condition may require."

The technical objections raised by the medical profession to the fundamental principles of osteopathy are numerous and have often been expressed in very strong terms. Even the more sober-minded members of the profession, while fully recognizing the value of methods like massage (q.v.) and Swedish movement (see MOVEMENT CURE) in certain cases, are very emphatic in denying that any such method can be applied in all cases without exception. Their objection is, therefore, not so much against the method itself as against its universal application, to the exclusion of medical diagnosis and of other therapeutic methods of recognized utility. In general, they object strongly to any but a person disciplined by several years' professional study taking full charge of cases in which the health, and perhaps the life, of human beings may be in great danger. Before the law the osteopath takes the position that he practices, not medicine, but osteopathy; that he cannot, therefore, be required to take a prolonged course of medical study; and that no law is in the way of his entering upon the practice of osteopathy after a few months of special training. This position has been often sustained by courts of justice, many judges defining the practice of medicine proper as the treatment of diseases by the use of drugs, while physicians generally define their practice as the treatment of diseases by any method whatever, whether involving the use of drugs, or the application of the methods of surgery, obstetrics, ophthalmology, hydrotherapy, etc.

Consult: Bonnet, "Attitude Toward Osteopaths," in *Columbus Medical Journal* (1902); "Education of Osteopaths," in *Southern Journal of Osteopathy* (1900).

OSTERHAUS, ōs'tẽr-hous, PETER JOSEPH (c.1820—). A German-American soldier, born in Coblenz, Germany. After serving for some time as a Prussian army officer, he emigrated to the United States and settled in Saint Louis. At the outbreak of the Civil War he was appointed a major of the Second Missouri Volunteers, and during the first year of the war was employed in Missouri and Arkansas, where he took a conspicuous part in the battles of Wilson's Creek (August 10, 1861) and Pea Ridge (March 7-8, 1862). In 1863 he commanded a division before Vicksburg, and at Chattanooga (November 23-25) he aided General Hooker in the capture of Lookout Mountain. He was then assigned to General Sherman's army, and after the capture of Atlanta received command of the Fifteenth Corps, one of the four corps into which the army was consolidated. He was mustered out of the service on January 15, 1866, and the same year was appointed United States Consul at Lyons, France, but subsequently made his home in Germany.

OSTERMANN, ōs'tẽr-män, ANDREI IVANOVITCH, Count (1686-1747). A Russian diplomat, born in Bochum, Westphalia, where he was christened Heinrich Johann Friedrich. He studied at Jena, whence he fled, because he had killed his opponent in a duel, to Holland, and there met Peter the Great and entered the new Russian Navy. He enjoyed Peter's favor, negotiated the treaties of the Pruth in 1711 and Nystad in 1721, became baron, and in 1725 Vice-Chancellor to Catharine I., who made him a member of the regency during Peter II.'s minority. Under the Empress Anna Ivanovna he was appointed Minister of Foreign Affairs (1730), and he kept the good will of Anna Leopoldovna when she became Regent, only to fall into disfavor with Elizabeth, who charged him with urging her exclusion from the succession and with the suppression of Catharine's will. He was sentenced to death, reprieved on the scaffold (1742), and banished to Siberia.

OSTERMANN-TOL'STOY, ALEXANDER IVANOVITCH (1770-1857). A Russian general. He entered the army when he was a boy, fought bravely in the Turkish campaign of 1790, and in 1805 commanded the Russian corps which, with Swedish and English divisions, attempted military operations in Northern Germany. As commander of the Fourth Army Corps in 1812 and 1813, he fought at Bautzen, where he was wounded, and he lost his left arm at Kulm.

OSTERODE, ōs'te-rō'de. A town in the Province of East Prussia, Germany, on Lake Drewenz, about 75 miles south-southwest of Königsberg (Map: Prussia, D 3). It is an ancient town with a castle built by Teutonic knights in 1270, a gymnasium, and a seminary for teachers. It has railway shops, machine works, saw mills, distilleries, a municipal slaughter-house, etc., and trades in grain, lumber, and cattle. Population, in 1900, 13,163.

OSTERODE. A town in the Province of Hanover, Prussia, situated in the Harz, 34 miles by rail northwest of Nordhausen. Its Church of Saint Ægidius, founded originally in the eighth century and rebuilt in 1578, contains interesting tombs of the princes of Grubenhagen. There is a large grain storehouse from which in times of scarcity the miners in the Harz Mountains are supplied at reduced prices. The manufactures of the town include woolen, cotton, and knit goods, machinery, metal works, cigars, leather, paint, etc. Population, in 1900, 7099.

OSTHOFF, ōst'hôf, HERMANN (1847—). A German comparative philologist, with Brugmann (q.v.) the head of the 'new grammarians.' He was born at Billmerich in Westphalia; studied at Bonn, Tübingen, and Berlin, and, after teaching in a gymnasium at Cassel, became in 1877 professor

of Sanskrit and comparative grammar at Heidelberg. He was one of the founders and editors of *Morphologische Untersuchungen auf dem Gebiete der indogermanischen Sprachen* (1878-90), and wrote: *Zur Geschichte des schwachen deutschen Adjectivums* (1876); *Das Verbum in der Nominalkomposition* (1878); *Zur Geschichte des Perfekts im Indogermanischen* (1884); *Vom Suppletivwesen der indogermanischen Sprachen* (1899); and *Etymologische Parerga* (1901).

OS'TIA. An ancient city of Latium, at the mouth of the Tiber, 15 miles from Rome. It is said to have been founded by Ancus Marcius, and was regarded as the oldest Roman colony. It first acquired importance from its salt works, the establishment of which is attributed to Ancus Marcius, and afterwards was the port where the Sicilian, Sardinian, and African corn shipped for Rome was landed. Its name first occurs during the Second Punic War. It was long the principal station of the Roman navy; but its harbor was exceedingly bad, and gradually the entrance became silted up with alluvial deposits, so that vessels could no longer approach it, but were compelled to ride at anchor and disembark their cargoes in the open road-tead. At length the Emperor Claudius dug a new harbor or basin two miles north of Ostia, and connected it with the Tiber by a canal. It was named the *Portus Augusti*, and around it soon sprang up a new town called *Portus Ostiensis*, *Portus Urbis*, *Portus Romæ*, and often simply *Portus* (modern Porto). The work of Claudius was carried further by Trajan. After the fall of the Roman Empire Ostia declined rapidly, and in the eighth century it was a mere ruin. During the Middle Ages a village—the modern Ostia—was built about half a mile above the site of the ancient town; but it has not more than about a thousand permanent inhabitants, who still carry on the manufacture of salt. Ostia has the reputation of being the seat of the earliest bishopric save that of Rome, and the Cardinal Bishop of Ostia (and Velletri) is Dean of the Sacred College. The ruins of the ancient Ostia extend for a mile and a half along the banks of the Tiber, and are nearly a mile in breadth.

OS'TIAKS. A name which seems to have been applied at first to the primitive Finnic peoples of the middle cis-Uralian upland valleys by the Russians and afterwards extended to trans-Uralian tribes as far as the Yenisei. The etymology of the name is uncertain, and its ethnological value has been different with different writers and at different periods. According to Sommier, the Ostiaks of the Obi are short in stature, spare in form as contrasted with the robuster or even fat Samoyeds, with brachycephalic headform and a considerable percentage of dolichocephaly. Their skin is quite white; the hair and eyes are brown. The Ostiaks are reported to be a disappearing people, their only resources being hunting and fishing. The Ostiaks of the region of the Narym, etc., are merely Samoyeds. The mass of the Ostiaks dwell between Obdorsk and Surgut—the Tas Ostiaks beyond Surgut are of mixed race. The Voguls and Ostiaks of the eastern slope of the Urals, who both call themselves Manzi, are very closely related by language, mythological ideas, and social institutions. Some intermixture with the Russian immigrants into Western Siberia has taken place. Consult: Seebohm, *Siberia in Asia* (London, 1882); Patkanoff, *Die Irtysch-Ostjaken und ihre Volkspoesie* (Saint Petersburg, 1897); Abercromby, *Prehistoric and Proto-Historic Finns, both Eastern and Western* (London, 1898); Martin, *Sibirica* (Stockholm, 1897).

OS TIA'RIUS (Lat., doorkeeper, sexton). The name of the lowest of the four minor orders in the Roman Catholic Church. In this definite sense, the earliest mention known of it occurs in a letter of Pope Cornelius of the year 251; it seems to have been included with the other minor orders by his predecessor, Pope Fabian (236-251). By the end of the sixth century the ordination of this office was symbolized by the bishop delivering to the candidate the keys of the church with the words, "So act as one that must give account to God for the things which these keys guard." The duties attached to the office are those which are now performed by the sacristan (q.v.).

OS'TIEN'SIS, PORTA (Lat., Gate of Ostia). A gate in the wall of Aurelian at Rome through which the Via Ostiensis passed. It dates from the time of Honorius, and its threshold is twelve feet above the level of the time of Aurelian, on account of the accumulation of rubbish leveled by Honorius. The gate was thrown open to the Goths by the Isaurians in 549. It was walled off in 1407 by King Ladislas of Naples, but was reopened in 1410, and is now the Porta di San Paolo.

OSTIENSIS, VIA (Lat., Road of Ostia). An ancient road leading from Rome to Ostia on the left bank of the Tiber, and continued southward as the Via Severiana, joining the Via Appia at Tarracina.

OSTINATO, ō'stē-nä'tō (It., stubborn). In music, a term applied to a constantly recurring short theme with constant changes in the other voices. Such themes are generally given to the bass, hence *basso ostinato*. It is a characteristic of the *chaconne* and *passacaglia* that they are always built upon such *basso ostinato*. In the compositions of the Gallo-Belgic school (see MUSIC, SCHOOLS OF COMPOSITION) the ostinato plays a very important part, as entire masses were written upon some short popular melody which as an *ostinato* was given to the tenor, while the other voices executed constantly new contrapuntal variations.

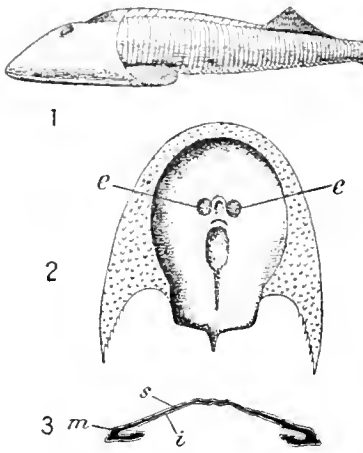
OSTRACISM (Gk. *ὀστρακισμός, ostrakismos*, from *ὀστρακίζειν, ostrakizein*, to ostracize, from *ὄστρακον, ostrakon*, potsherd). A method of political procedure in ancient Athens, whereby a citizen whose presence seemed dangerous to the State might be exiled for a time. It was said to have been introduced by Clisthenes in his reform of the Athenian constitution after the expulsion of Hippias (B.C. 510), but the first use of it seems to have been made in B.C. 488-487, when Hipparchus, son of Charmus of Collytus, was exiled, on account of his connection with the Pisistratidæ. Two others of this party followed, and in B.C. 485-484 Xanthippus, father of Pericles, was a victim, while a year or two later Aristides was banished. After the Persian wars the process was less frequently employed, though it was still used when party strife waxed hot and it seemed necessary to secure a definite verdict in favor of one policy. Among the ostracized were Themistocles, Cimon, Thucydides, son of Melesias, and Hyperbolus, whose ex-

ile really resulted in the abandonment of the system. The vote had been intended to decide between Nicias and Alcibiades, but they combined their forces against the much less influential Hyperbolus. Ostracism did not inflict any stigma upon a man, nor were his property or civil rights in any way disturbed. It simply required him to leave the country for ten years in order that he might exercise no influence on the course of politics. It thus afforded a means of deciding between rival leaders and their policies, and insured to the victor an opportunity to carry out his plans undisturbed by violent opposition. Every year, in the sixth prytany, the assembly voted whether a vote of ostracism should be taken during the year. If the decision was affirmative, a day was chosen in the eighth prytany, the market was fenced off, and through ten gates the members of the ten tribes entered to deposit the potsherds on which was written the name of the man whose ostracism was sought. To make the decision valid, at least 6000 votes were required, but of these a plurality seems to have sufficed to ostracize. Besides the Histories of Greece by Grote, Curtius, Busolt, Holm, and E. Meyer, consult: Gilbert, *The Constitutional Antiquities of Athens and Sparta*, English translation (London, 1895); Hermann, *Lehrbuch der griechischen Antiquitäten*, I., "Staatsaltertümer," by Thumser (Freiburg, 1892); Busolt, *Griechische Staats- und Rechtsaltertümer* (Munich, 1892).

OSTRAC'ODA (Neo-Lat. nom. pl., from Gk. *ὀστρακώδης, ostrakōdēs*, like a potsherd, from *ὄστρακον, ostrakon*, potsherd + *εἶδος, eidos*, form). An order of crustacea in which the body is compressed and wholly protected by a bivalved shell or carapace. Besides the two sessile eyes and a median one, the former sometimes wanting, there are two pairs of antennæ, a pair of mandibles, two pairs of maxillæ, and two pairs of legs. The body is not divided into segments and the abdomen is rudimentary. The two valves are closed by a two-headed adductor muscle, the valves being joined together along the hinge-margin by an elastic ligament. In swimming, or in walking over the bottom, the valves gape partly open, the slender legs protruding. Respiration is aided by a comb-like bristly plate attached to the first pair of maxillæ, but there are no true gills. The young of the fresh-water Cypris hatches in a modified nauplius stage, but already inclosed in a thin shell covering the entire body. In the marine forms there is no metamorphosis, development being direct. Ostracods feed on animal matter; they abound in the fresh water, but the larger number are marine, and exist at all depths. Many of the littoral as well as deep-sea forms are covered with thick shells more or less tuberculated, pitted, or otherwise ornamented. Fossil Ostracoda first appear in the Cambrian rocks. The order attained its maximum development in the Ordovician period, and in the Cretaceous modern forms began to appear. See CRUSTACEA.

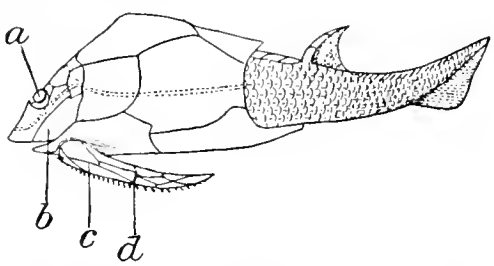
AN OSTRACOD (*Cypris*).

OSTRACODER'MI (Neo-Lat. nom. pl., from Gk. *ὀστρακόδερμος, ostrakodermos*, having a skin like a potsherd, from *ὄστρακον, ostrakon*, potsherd + *δέρμα, derma*, skin). A group of pleetognath fishes which are without spines in the dorsal fin, and have the body inclosed in an angular box, or carapace, formed by polygonal bony scutes firmly joined at their edges; they are the trunk-fishes (q.v.).



CEPHALASPIS.

1, restoration of *Cephalaspis Murchisoni*, about one-fourth natural size; 2, diagram of lower aspect of dorsal shield, showing inferior rim; *e, e*, position of eyes, with the interorbital ridge; 3, diagrammatic section of dorsal shield; *i*, inferior lamina; *m*, margin; *s*, superior lamina.



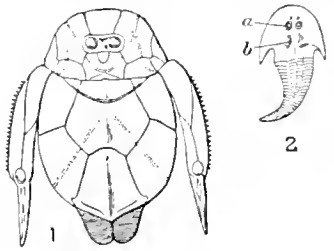
PTERICHTHYS.

Restoration of *Pterichthys Milleri*, of the Old Red Sandstone; *a*, orbit of eye; *b*, gill cover; *c*, one of the pair of lateral appendages; *d*, joint in appendage. The dotted lines indicate grooves for the sensory canal.

FOSSIL FORMS. Ostracoderms are the most primitive subclass of Paleozoic fossil fishes, characterized by the heavy calcareous plates that cover the head and forward part of the trunk, and by the absence of the lower jaw. These primitive fish-like vertebrates are supposed to be the ancestral forms from which the higher groups of fishes, and also all the other types of vertebrates, have descended by evolution. They appear first in the Upper Silurian rocks of Europe and North America, and they continue through to the top of the Devonian in both countries. The simplest forms are Cyathaspis and Palæaspis, found in the Upper Silurian and Devonian, and Pteraspis of the Devonian. Cephalaspis, one of the best known members of the group, has a horseshoe-shaped head-shield, and is found in the Silurian and Lower Devonian of Great Britain and in the Upper Devonian of Eastern Canada.

The highest members of the subclass, represented by Bothriolepis and Pterichthys, have dermal skeletons of far more complex nature than those seen in the other members of the group.

The heavy plates are more numerous and are symmetrically arranged, and attached to the sides of the head-shield is a pair of fin-like appendages, which are not, however, homologous to the fins of fish, though they closely resemble these latter. The hinder portion of the body was covered by small ganoid scales. Consult: Woodward, *Outlines of Vertebrate Palæontology for Students of Zoology* (Cambridge, 1898); Von Zittel and Eastman, *Text-book of Palæontology*, vol. ii. (New York, 1903). See CEPHALASPIS; CYATHASPIS; PTERASPIS; PTERICHTHYS.



OSTRACODERMI.

1, restoration of *Bothriolepis hydrophila* of the Old Red Sandstone; 2, *Auchenaspis Egertoni*: *a*, orbits; *b*, post-orbital depression.

OSTRAU, ôs'trou. Two neighboring towns of Austria. See MÄHRISCH-OSTRAU and POLNISCH-OSTRAU.

OSTRICH (OF. *ostruche*, *austruche*, Fr. *autruche*, Sp. *avestruz*, from Lat. *avis struthio*, ostrich bird, from *avis*, bird, and *struthio*, from Gk. *στρουθών*, *strouthiōn*, ostrich, *στρουθοκάμηλος*, *strouthiokamēlos*, ostrich, camel-sparrow, so called from the long neck of the bird, from *στρουθός*, *strouthos*, bird, sparrow). The ostrich is the largest of living birds, long renowned for its beautiful plumes and its remarkable speed. Whether all ostriches belong to the same species is still an open question, for although four have been described, the differences suggested are very slight and may prove inconstant. There is, however, only a single genus, Struthio, and a single family, the Struthionidæ. The relationship of this family to the rheas, emeus, cassowaries, etc. (qq.v.), is still undecided, but all are members of the order Ratitæ, distinguished from all other living birds by the absence of any 'keel' on the breastbone. (See RATITÆ.) Ostriches are natives of Africa and some parts at least of Southwestern Asia. The common ostrich or 'camel-bird' (*Struthio camelus*) is found on the dry open plains and deserts of Northern and Central Africa (except Egypt), while the ostriches of Southern Africa, Somaliland, and Asia have been described as distinct species. Fossil remains of the ostrich have been found in India.

The male is somewhat larger than the female, measures seven feet, more or less, in height, and weighs upward of 200 pounds. His plumage is strikingly loose, fluffy, and deep black in color; only the 'plumes' (quill feathers) of the wings and tail are white. The female is much less handsome (dull brownish gray), while the very young chicks are yellowish, marked with longitudinal streaks of blackish. The young male assumes his mature plumage in about three years. In the adult of both sexes the head and most of the neck are nearly bare, only a sparse down covering the skin. The feet and legs also are bare far up on the tibiæ. The bill is of moderate length, broad, flattened, and rounded at the tip, and with the nostrils opening considerably in front of the base. The ostrich is unique in several anatomical peculiarities: there are only two toes (the third and fourth), the outer of which is much smaller and has no claw; there is a small external tail; and the pubic bones unite in a ventral symphysis. The wings bear three digits, but are so small as to be useless for flight, though they assist greatly in running. The legs, however, are big and powerful, and able to deliver a kick almost equal to that of a horse. The alimentary canal has a very muscular gizzard, as well as a large crop. There is no gall bladder. The food of the ostrich is chiefly vegetable, though small mammals, reptiles, and insects are sometimes taken. Water can be spared from the diet for long periods of time, if melons or other juicy fruits are available. Coarse gravel and small stones are swallowed to assist in the grinding work of the gizzard. In spite of an imperfect syrinx, the ostrich has a loud voice, said to resemble the roar of the lion, though its most common sound is an angry hiss.

The ostrich is polygamous, one male consorting with from two to seven females. He scoops out a hollow in the sand in which his companions lay their eggs, each female laying about ten. The eggs are not left to the heat of the sand and sun, as is often stated, but are incubated during the greater part of the day by one of the females, and at night by the male. When the eggs are left during the heat of the day, they are covered up with sand. The eggs are large and thick-shelled, of a creamy-yellow shade, with numerous small pits in the otherwise very smooth surface. Each egg is about six inches long and weighs nearly three pounds, while its cubic contents approximates that of two dozen hen's eggs. The bird is extraordinarily keen-sighted, and on its native plains is extremely wary. Hunting the ostrich has been a popular sport with the Arabs from time immemorial. They rely on the speed of their horses and run the birds down, a feat which would be impossible were it not for the curious fact that the ostrich runs in more or less of a circle, and the horsemen are thus able to continue the pursuit while traveling only a fraction of the distance that the bird runs. At full speed the ostrich is said to make sixty miles an hour, and for a limited time it can completely distance the fleetest horse.

OSTRICH-FARMING. For many centuries ostriches have been partially tamed or domesticated on a small scale by some of the tribes of Central and Northern Africa, but it is only since about 1860 that any extensive efforts have been made to supply the demand for ostrich plumes from domesticated birds. First in Cape Colony, later in Algeria and Argentina, and finally in the Southwestern United States, ostrich-farming was taken up as a profitable employment, and at the opening of the present century millions of dollars' worth of fine ostrich plumes were sent to market annually from ostrich farms. A consular report in 1899 stated that 261,000 ostriches were owned in Cape Colony alone. The farms of Arizona and southern California long since passed the experimental stage. Their birds are either pastured in small flocks, or a cock and one or two hens are kept in areas inclosed with coarse wire-

netting fences six or seven feet high; these pastures are usually arranged in pairs, so that when the alfalfa, upon which the birds feed, is exhausted in one field, the birds may be driven into the other. They also receive grain. The birds rarely fall ill, and are quite prolific in captivity, a male and two females having been known to produce 188 eggs in a year, about 80 per cent. of which yielded chicks. Artificial incubation is usually practiced, ordinary incubators with unusually large trays being used. When six or seven months old, the birds undergo their first plucking, and thereafter at intervals of about seven months new crops of plumes may be gathered. The plumes are cut off, not pulled out, but after a few days the dead stumps are removed to make room for the new feathers. The price of the plumes varies very greatly with the quality, but each bird on a well-managed farm will yield from $30 to $60 worth at a plucking. As the ostrich lives to be as much as eighty years old, there is an opportunity for large profit from each one.

Consult: Mosenthal and Harting, *Ostriches and Ostrich Farming* (London, 1879); Martin, *Home Life on an Ostrich Farm* (London, 1891); Paul, "Ostrich Farming in California," in *Cosmopolitan Magazine*, vol. xi. (New York, 1891); Newton, *Dictionary of Birds* (New York, 1896), where many further references may be found.

OSTRICH FERN (*Struthiopteris*). A genus of ferns whose fertile fronds have somewhat the appearance of an ostrich plume, and whose sterile ones attain a height of even ten feet, the whole plant forming a beautiful vase-like cluster. There is one species (*Struthiopteris germanica* or *Onoclea struthiopteris*) known in America and Europe, and there is probably another in Japan. The American species thrives best in northern latitudes in alluvial soil.

OSTROG, ŏs-trôg'. A town in the Government of Volhynia, Russia, about 90 miles west of Zhitomir (Map: Russia, C 4). It has a gymnasium, a teachers' seminary, and ruins of an old castle. Leather is the chief product; there is some trade in grain, wool, and leather. Ostrog was formerly the residence town of a Polish principality of the same name, and is noted as the place where the first Bible in the Slavonic language was printed in 1581. The town came into the possession of Russia in 1795. Population, in 1897, 14,530, largely Jewish.

OSTROGOSH, ŏs-trō-gōsh'. A town of South-Central Russia, in the Government of Voronezh, situated 50 miles south of Voronezh. It has a high school and numerous churches, manufactures tobacco and soap, and carries on trade in cattle and agricultural products. Population, in 1897, 21,897.

OSTROGOTHS. See GOTHS.

OSTROLENKA, ŏ'strō-lyĕn'kȧ. A town in the Government of Lomza, Russian Poland, situated on the Narev, 22 miles southwest of Lomza (Map: Russia, B 4). Its chief industry is the manufacture of small articles from amber which is found in the vicinity. The town is noted as the scene of two important battles. On February 16, 1807, the Russians under Essen were defeated by the French under Savary, and during the uprising of 1830-31 the Poles were defeated by the Russians after an heroic struggle in which the former lost about 9000 men (May 26, 1831). Population, in 1897, 8697, chiefly Poles and Jews.

OSTROVSKI, ŏs-trôf'skĕ. ALEXANDER NIKOLAYEVITCH (1823-86). A Russian dramatist. He was born in Moscow. In 1843 he accepted a position in the Commercial Court, and to this is largely due his minute knowledge of mercantile scheming and fraud, which play such an important part in his comedies. After making his début with *Pictures of Family Happiness* in 1847, he attracted considerable attention by excerpts from his comedy *We Can Settle with Our Own People*, and left his post for literature. The complete work produced a sensation, and forty-three comedies followed. Yet, for many reasons, Ostrovski felt the pinch of need until shortly before his death, and, while idolized at Moscow, he found scant recognition at Saint Petersburg. Just before his death he was appointed director of the Moscow theatres. The dream of his life—to be at the head of a school for dramatic acting—was realized; but the inordinate zeal with which he threw himself into the work wrecked his constitution. Among his dramas the best are: *Do Not Get into Somebody Else's Sled; Poverty is Not a Fault; The Forest; A Profitable Position; The Guiltless Culprits;* and *The Storm* (1860). An English translation by Constance Storm of the last-named play, generally considered his masterpiece, was given in the spring of 1900 at the Carnegie Lyceum, New York, by an independent company. His plays embrace all types of the middle classes. These he was able to draw with striking accuracy, because of his perfect objectivity. His works were published in ten volumes (9th ed., Saint Petersburg, 1885), and with a biography by A. Nos (Moscow, 1890; 10th ed., 1896-97). His translations (2 vols., Saint Petersburg, 1886) are masterpieces of their kind, and especially noteworthy among them is Shakespeare's *The Taming of the Shrew*. Several plays of his have been translated into French by Durand Grenville.

OSTROWO, ŏs-trō'vō. A town in the Province of Posen, Prussia, 50 miles northeast of Breslau (Map: Prussia, G 3). It is an important grain-trading centre, and has saw mills and brick kilns. Population, in 1890, 9700; in 1900, 11,800.

OSTUNI, ŏs-tōō'nê. A city of Southern Italy, in the Province of Lecce, situated 19 miles northwest of Brindisi, on the Bari-Brindisi Railroad (Map: Italy, M 7). Several towers of the old city-wall are still to be seen. The city has a library containing a collection of antiquities. Oil and lime are manufactured. Population (commune), in 1881, 18,226; in 1901, 22,997.

OSTWALD, ŏst'vȧlt, WILHELM (1853—). An important German chemist, born at Riga. He was educated at Dorpat, became a lecturer there in 1878, in 1882 was a professor in the Polytechnicum of Riga, and in 1887 professor of chemistry in Leipzig. As an investigator in connection with physical chemistry and chemical affinity he became particularly well known. His researches have concerned, among numerous subjects, the electric conductivity of organic acids, the parallel existing between the volume of such acids and their power of chemical reaction, and the color of ions. Among his publications are his *Lehrbuch der allgemeinen Chemie* (2 vols.,

1885-88; 2d ed. 1891 et seq.); a *Grundriss der allgemeinen Chemie* (2d ed. 1890), *Elektrochemie* (1896), and *Volesungen uber Naturphilosophie* (1902). In 1887 he established with van't Hoff at Leipzig the *Zeitschrift fur physikalische Chemie*, and in 1901 became editor there of the *Annalen der Naturphilosophie*.

OSUNA, ō-sōō'nà. A town of Southern Spain, in the Province of Seville, situated in a fertile plain, 48 miles east of Seville (Map: Spain, C 4). It is well built, with plazas and promenades, and contains a large Gothic collegiate church. The chief manufactures are woolen textiles, soap, and hats. Population, in 1887, 19,376; in 1900, 17,826. Osuna is the ancient Urso, later Orsona, a Roman garrison town. It took the side of the Pompeians in the Civil War, and is noted for its long and brave defense against the soldiers of Cæsar.

OSUNA, Pedro Tellez y Giron, Duke of (1579-1624). A Spanish statesman. He was born at Valladolid, studied at Salamanca, and suffered exile in his youth for his liberal opinions. Under Philip III. he was appointed Viceroy of Sicily in 1611 and of Naples in 1616. He gave the country a wise administration, opposed the establishment of the Inquisition at Naples, and resisted the attempt of Venice to control the commerce of the Mediterranean. He was implicated in the conspiracy of Bedmar (q.v.) against Venice, and dispatched a fleet against that city in 1618, but met with defeat. He was recalled in 1620 on suspicion of planning to usurp the government of South Italy, was confined in the Castle of Alameda, and died there.

OS'WALD, Saint (c.605-642). King of the Northumbrians from 634 to 642. He was a son of Ethelfrid of Northumbria, and on the death of the latter in 617 he spent some years in exile with the Scots in Iona, during which time he was converted to Christianity. In time he and his brothers drove out the Anglian invaders, and after his brother Eanfrid was treacherously slain by the British King Caedwalla in 634, he ascended the throne after having defeated and slain his brother's murderer in battle. He married Cyneburh, a daughter of Cynegils, a West-Saxon King, and with her assistance and that of Saint Aidan (q.v.) introduced the Christian religion among the Anglo-Saxons. He was killed in a battle at Maserfelth against Penda, King of Mercia, and was canonized by the Roman Catholic Church.

OSWALD, Eleazer (1755-95). An American soldier and journalist. He was born in England. He became interested in the American Revolutionary cause and emigrated to America in 1770. In 1775 he served as captain under Arnold at Ticonderoga and at Quebec, where he assumed command and distinguished himself when Arnold was wounded. He was Arnold's secretary, and in 1777 was promoted to be lieutenant-colonel in Lamb's artillery regiment. He became a printer and publisher at Philadelphia and later at New York. In all political questions he was a bitter opponent of Hamilton. In 1792 the French Revolution enlisted his sympathy, and he commanded a regiment of artillery in the French army at the battle of Jemappes. After a fruitless secret mission to Ireland on behalf of the French Government, he returned to New York, where he died of yellow fever, September 30, 1795.

OSWALD, Richard (1705-84). A British diplomat. He was born in Scotland, and after spending several years in America became a London merchant. He was chosen by Lord Shelburne as one of England's representatives at the signing of articles of peace at the close of the Revolutionary War. He gave bail in the sum of £50,000 for Henry Laurens (q.v.).

OSWALDTWISTLE, -twis'l. A town in Lancashire, England, on the Leeds and Liverpool Canal, 3½ miles east-southeast of Blackburn (Map: England, D 3). It has manufactures of cottons and chemicals; there are collieries, potteries, and stone quarries. It owns its gas and water works and abattoirs, and maintains a technical school and an isolation hospital. Population in 1891, 13,300; in 1901, 14,200.

OSWALD VON WOLKENSTEIN, ōs'vält fon vōl'kĕn-stīn (1367-1445). A German poet. He was born at Gröden of a noble Tyrolese family, and lived an eventful life, fighting from boyhood until he was past fifty in almost every country of Europe, and in Persia and the Holy Land besides. The poetic manner of Oswald is sometimes strained and pedantic; and he is as much a predecessor of the *Meistergesang* as a follower of the Minnesingers. His poems were edited by Weber (1847). Consult: Weber, *Oswald von Wolkenstein und Friedrich mit der leeren Tasche* (Innsbruck, 1850); and Zingerle's biography and critique (Vienna, 1870).

OSWE'GO. A city and the county-seat of Labette County, Kan., 159 miles south of Topeka; on the Neosho River, and on the Saint Louis and San Francisco and the Missouri, Kansas and Texas railroads (Map: Kansas, G 4). It is in an agricultural and stock-raising region, and has fine water power. Flour is manufactured, and coal is mined in the vicinity. The Library Association, founded in 1878, has 4000 volumes. Population, in 1890, 2574; in 1900, 2208.

OSWEGO. A city, port of entry, and the county-seat of Oswego County, N. Y., 36 miles north by west of Syracuse; the terminus of the Oswego Canal, on Lake Ontario at the mouth of the Oswego River, and on the New York, Ontario and Western, the Delaware, Lackawanna and Western, and the Rome, Watertown and Ogdensburg railroads (Map: New York, D 2). It is finely situated at a slight elevation above the lake, and is laid out with regular and broad streets. Fine drives skirt both sides of the river and the shore of the lake. There are six public parks. Oswego is the seat of a State normal and training school, and has the Gerritt Smith Library. Other prominent structures are the city hall, court house, United States Government Building, and the State Arsenal. A United States life-saving station is here; and the old French fort possesses an historic interest. Fort Ontario defends the harbor, which consists of an outer and an inner haven, protected by breakwaters and accessible for large steamers. There are three immense trestles that facilitate the extensive coal trade carried on by the port. Considerable quantities of grain and lumber also are handled. The foreign commerce of Oswego in 1901 consisted of exports valued at $2,092,000, and imports to the amount of $644,000. The city has excellent water power, and is noted for its manufactures, which include starch, knit goods, shade

cloth, car springs, boilers and engines, malt, yarn, matches, oil-well supplies, etc. In the census year of 1900 an aggregate capital of $7,525,000 was invested in the various industries, which had a production valued at $8,138,000. Under the charter of 1896, the government is vested in a mayor, elected biennially, and a common council. The members of the department of fire and police are chosen by popular vote. Appointments to other important offices are controlled by the Mayor, whose nominations to some departments are made, however, subject to the consent of the council. Oswego owns and operates the water-works. Population, in 1890, 21,842; in 1900, 22,199.

Established as a military station and trading post about 1724, Oswego was incorporated as a village in 1828, and was chartered as a city in 1848. Owing to its location, it was an exceedingly important post in King George's War and the French and Indian War. In 1755 Colonel Mercer built two strong forts here, and in August, 1756, General Montcalm attacked and captured the place, and demolished the works, 30 men being killed or wounded on each side, and 1700 English prisoners being taken. In 1759 Oswego was the centre of military operations in this part of the country, and the point from which General Amherst with 10,000 men started to meet Wolfe at Quebec. In 1766 Pontiac here met Sir William Johnson and formally submitted to the English. On May 6, 1814, a strong English force captured the fort after a sharp engagement. Consult Churchill, Smith, and Child, *Landmarks of Oswego County* (Syracuse, N. Y., 1895).

OSWEGO BASS. A local name in New York State for the large-mouthed black bass.

OSWEGO TEA (*Monarda didyma*). An erect odorous herb of the natural order Labiatæ. It has bright red, showy flowers, much visited by bees, for which it is often planted as a pasturage; hence the name bee-balm.

OSWESTRY, ŏz'ĕs-trĭ. A municipal borough and market-town in Shropshire, England, 15 miles northwest of Shrewsbury (Map: England, C 4). The town has good public buildings. Its chief trade is agricultural: it has railway works, manufactures of machinery and agricultural implements, breweries, and tanneries. Coal mines and limestone quarries are worked in the neighborhood. It owns its water-works and markets, has installed a modern system of sewage disposal, and maintains a library, a gymnasium, and an isolation hospital. An early British town, it was the scene of frequent conflicts between Saxons and Welsh and Normans and Welsh. Oswald's Well and Old Oswestra, an early British encampment, are neighboring points of interest. Population, in 1891, 8500; in 1901, 9600. Consult: Spaull, "History of Oswestry Parish Church," in *Genealogical Magazine*, vol. i. (London, 1897); Lacey, "Municipal Work and Progress in Oswestry," in *Surveyor* (London, 1901).

OS'YMAN'DYAS (Lat., from Gk. *Ὀσυμανδύας*). The name of a King of Egypt who, according to Greek writers, invaded Asia with a large army, greatly distinguished himself by his victories, and conquered the Bactrians, who had revolted from him. Diodorus describes a magnificent monument, the Osymandeion, erected by this monarch in the Theban necropolis near the tombs of the concubines of Ammon. The name Osymandyas is merely a corrupt Greek form of *Usr-maʿ(t)-rē*, the prenomen of Rameses II., and there can be little doubt that the Osymandeion was in reality the Ramesseum, built by Rameses on the western bank of the Nile at Thebes. The exploits attributed to Osymandyas are as fabulous as those ascribed by the Greeks to Sesostris (q.v.). Consult: Diodorus, i., 47-49; Tzetzes, *Chiliades*, iii., 892; iv., 620; Budge, *A History of Egypt* (New York, 1902).

OTAGO, ō-tä'gō. The southernmost provincial district of South Island, New Zealand. It is bounded on the north by the Province of Canterbury, and on the west, east, and south by the Pacific Ocean (Map: New Zealand, B 6). Area, about 25,487 square miles. Population, in 1891, 153,097; in 1901, 173,111. The most important gold-fields of New Zealand are in this province. Capital, Dunedin.

OTAHEITE, ō-tä'hē-tē *or* ō'tä-hē'tē. The former name of an island in the South Pacific. See TAHITI.

OTAL'GIA (Neo-Lat., from Gk. *ὠταλγία*, earache, from *οὖς, ous*, ear + *ἄλγος, algos*, pain). Neuralgia of the ear. The pain is non-inflammatory, and occurs in all degrees of severity. It may arise from disease of the nerves of the ear, or may be transmitted to them reflexly from other sources. Decaying teeth are a fruitful source of otalgia; it is sometimes a symptom of ulcer or cancer of the tongue, rheumatism of the temporo-maxillary joint, etc. When patients complain of *earache*, the pain is far more commonly due to *otitis media*, or inflammation of the tympanic portion of the ear, a much more serious affection. See OTITIS MEDIA.

OTARU, ō-tä'rŭ. The second seaport of Yezo, Japan, situated on the western coast of the island, 22 miles by rail west of Sapporo (Map: Japan, G 2). It is important principally on account of its herring fisheries, which give occupation to a large proportion of the inhabitants. Some flint implements of Aino origin are the only trace of the aborigines. Population, in 1898, 56,961.

O'TARY (from Gk. *ὠτᾰρός, ōtaros*, large-eared, from *οἰς, ous*, ear). An eared seal. See SEAL.

OTAVALO, ō'tä-vä'lō. A town of the Province of Imbabura, Ecuador, 26 miles northwest of Quito, at an elevation of 8422 feet above the sea (Map: Ecuador, B 3). The town is well built and has some cotton and woolen mills. It was founded in 1534 and almost totally destroyed by an earthquake in 1868. Its population is about 6000.

OTCHAKOV, ŏ-chä'kŏf. A fortified seaport of Southern Russia, in the Government of Kherson, situated at the mouth of the Dnieper, 60 miles east of Odessa (Map: Russia, D 5). Its harbor is much frequented by coasting vessels. It was formerly an important Turkish fort, the last remnants of which were blown up by the Russians in the Crimean War. The present fortifications are modern, and command the entrance to the Dnieper. Population, in 1897, 10,784.

OTFRIED, ōt'frĕt (c.800-c.870). An Alsatian poet and theologian. As a student at the Abbey of Saint Gall he was a friend of Solomon, after-

wards Bishop of Constance; he then studied at Fulda under Rabanus Maurus. Next Otfried became priest and monk in the wealthy abbey of Weissenburg, where he acted as a notary (851). His fame is due wholly to his Frankish or Theodisc (Deutsch) poem on the Gospels. Not understanding Latin hymns, the Frankish folk kept up their heathen songs. Otfried made up his mind to do away with this habit by putting Christian songs into Frankish, declaring that he would break the Devil's wickedness, cast down foul legends, and rid his people of the songs that only awoke worldly longings, that wounded the ears of the righteous and saddened the heart. Otfried's *Liber Evangeliorum Domini Gratia Theodisce Conscriptus* begins with dedications to Louis the German and to Bishop Solomon in Frankish verses, and to Liutbert, Archbishop of Mainz, in Latin prose. The poem is fifteen thousand verses long and in strophes like the Latin hymns. It is remarkable because it uses rhyme instead of the alliteration customary in Old Germanic poetry, and because it has a regular, even a Latin rhythm. Poetically, it is inferior to the *Heliand*, a work of similar character. On the ground that we have five senses, and that each sense stirs us to its special sin, Otfried divided his poem into five parts: (1) The nativity of John the Baptist; (2) the meeting of the first disciples, the first miracles, the spread of Christ's teachings; (3) the story of astounding miracles that shook the Jewish faith; (4) the Passion; (5) the Resurrection, the Ascension, and the Judgment. It is doubtful whether this poem, ended in 856, ever accomplished Otfried's aim; yet it is for the philologist and the student of cultural history a work of great value. Of Otfried's other writings only a few bits are left. The best manuscript of his *Liber Evangeliorum* is at Vienna. Consult: Piper, *Otfrieds Evangelienbuch* (Freiburg, 1884); Kelle's *Text* (Regensburg, 1856-69); *Glossary* (ib., 1879-81); Erdmann's *Text* (Halle, 1882-83); translations by Rapp (Stuttgart, 1858), Rechenberg (Chemnitz, 1862), and Kelle (Prague, 1870). Consult also: Lachmann, in his *Kleinere Schriften* (Berlin, 1876); Schütze, *Beiträge zur Poetik Otfrieds* (Kiel, 1887); and Tesch, *Zur Entstehungsgeschichte des Evangelienbuches von Otfried* (Greifswald, 1890).

OTHEL'LO, THE MOOR OF VENICE. A tragedy by Shakespeare, written probably in 1604, printed in quarto 1622, and in folio 1623. It was produced probably in 1605, and positively in 1610 according to the diary of the Prince of Württemberg's secretary. Shakespeare found the story in "Un capitano moro," one of the Italian novels in Cinthio's *Hecatommithi*, a collection published in 1565. A French translation appeared in 1584, but no English version was extant. The general plan of the Italian story was followed in the tragedy, but none of the names were used except a modified form of Desdemona. The history of Venice gives an account of one Moro, a Governor of Cyprus, whose wife died on the return voyage under mysterious circumstances, and this may be the historical basis of the tale. The title Moor means an Arab.

OTHMAN, ŏth-män' (Ar. *'Uthmān, ibn 'Affān*). The third Caliph of the Moslems. He was born about 574. He belonged to the family of the Prophet, and was cousin german of Abu Sufyan. An early convert to Islam, he was one of its most zealous supporters, and linked himself still more strongly to Mohammed by becoming his son-in-law, marrying first his daughter, Rukaiya, and after her death, her younger sister, Umm Kulthum. He was elected to succeed Omar in the Caliphate late in the year 644. The choice was not made without much unseemly strife, Othman's most formidable opponent being Ali. The worldly motives that entered into the policy of Othman soon brought on serious difficulties. The able and energetic leaders who had been appointed by Omar were superseded by members of Othman's own family, and of that of Abu Sufyan. Egypt revolted, and the Caliph was compelled to reinstate Amru in the government of that country, and several other rebellions were only quelled by a similar restoration of the previous governors. Zealous Moslems deplored the folly of their chief, and were indignant at seeing the chair of the Prophet occupied by Othman while Abu-bekr, and even Omar, were accustomed to seat themselves two steps below it. Emboldened by the knowledge of his vacillating and cowardly disposition, they showered upon him reproaches and menaces; the bearer of their remonstrances having been bastinadoed by Othman's order, a general revolt ensued. Othman averted the crisis by unconditional submission; but having soon after attempted to put to death Mohammed, the son of Abu-bekr, the latter made his appearance at Medina at the head of a troop of malcontents, and forcing his way to the presence of Othman, stabbed him to the heart (656). It was under Othman that the second revision of the Koran was made, and an authentic copy prepared which served as the standard and prototype. See CALIPH; MOHAMMEDANISM.

OTHMAN or **OSMAN I.,** surnamed AL-GHAZI, i.e. the Conqueror (1259-1326). The founder of the Ottoman power. He was born in Bithynia, his father, Ertogrul, having been the chief of the Turks in Phrygia. On the death of the latter, in 1288, his tribe chose his son Othman (i.e. the 'young bustard') as his successor. Othman conquered all the west of Asia Minor—Nicæa (1304), Marmora (1307), and Brusa, taken just before his death by his son Orkhan (1326). He had the usual failing of Oriental despots, being of a dissimulating and treacherous nature when it served his aims. At the same time he was wise and politic. Othman held his Court at Kara-Hissar, and struck money in his own name, but it is doubtful whether he ever took the title of Sultan. From him are derived the terms Ottomans and Osmanlis, which are employed as synonymous with Turks. Consult Hammer-Purgstall, *Geschichte des osmanischen Reiches* (4 vols., 2d ed., Pesth, 1834-36). See TURKEY.

OTHMAN II. (1605-22). A Turkish Sultan, son of Achmet I. He succeeded his uncle, Mustapha I., in 1618, ruled with much energy, and made war on Sigismund III. of Poland. Defeated at Khotin, the Sultan swore to take vengeance on the Janizaries for the miscarriage of his plans, and was killed in a revolt of that body when he was only seventeen.

OTHO I., THE GREAT (912-73). The founder of the Holy Roman Empire of the German nation (*Heiliges römisches Reich deutscher Nation*). He was the eldest son of Henry the Fowl-

er, king of Germany, and was early recognized as the successor to the crown. In 936, on the death of his father, who left him the Duchy of Saxony, he was elected and crowned as King of the Germans, though his brother Henry, who had been born in the purple, was the favorite of many. Immediately upon the news of the death of King Henry, the various conquered Slavic tribes arose, and amid these foreign wars, civil strife soon raged, which centred around King Otho's brother Henry. Otho with the assistance of Hermann Billung repulsed the Slavs and Hungarians, leaving their total subjugation to a more favorable time. Meanwhile, however, Duke Eberhard of Franconia, feeling himself injured by Otho, conspired with Henry, the brother of Otho, Giselbert of Lorraine, and others, and was supported by Louis IV. of France. But, though the danger for a long time was great, Otho finally triumphed; in 939 Eberhard and Giselbert were killed, and Henry became reconciled to his brother. A new assignment of the duchies was thereupon carried out by Otho, who gave them to faithful relatives and devoted followers, and bound them closer to the Crown than they had ever been. Meanwhile Otho's fame had spread and he embraced the opportunity for interfering in Italian affairs when he was summoned by Queen Adelaide, the widow of King Lothair, to protect her from her importunate suitor, Berengar II. In 951 Otho answered the call, Berengar was defeated, and Adelaide became Otho's second wife. Berengar II. was permitted by Otho to rule as his feudatory. But though Otho thus was master of Northern Italy, he was unable to take Rome, which was held by Alberic II. (q.v.), and in 952 he returned to Germany, where a rebellion, incited by Lindolf, son of his first wife, soon threatened to overturn his throne, especially as the Hungarians, taking advantage of the internal strife, invaded Germany in 954. But the rebels were finally overcome, and the Hungarians were decisively defeated in 955 in the battle on the Lechfeld, which ended their raids forever.

In 954 Alberic II. died, and his son Octavian became Pope as John XII. Against him Berengar took up arms, whereupon Otho sent his son Liudolf into Italy. Liudolf died in 957, and four years later the German King himself crossed the Alps for the second time and put an end to the rule of Berengar. The gates of Rome were opened to him, and in 962 he received from John XII. the Imperial crown, thus founding the Holy Roman Empire of the German nation and establishing that close connection between Italy and Germany which formed so important a feature of mediæval history. Otho lost no time in asserting his Imperial prerogatives, and having called a council, effected the deposition of John, whose licentiousness had become a burden to Italy and a scandal to Christendom, and caused Leo VIII. to be elected in his place. This resulted in renewed wars, in all of which Otho was victorious. In order to obtain control over the whole of Italy, Otho sought the hand of the Greek princess Theophano for his son and presumptive successor. An embassy to Constantinople in 968 failed, as we know from the account of one of the ambassadors, Liudprand (q.v.). Thereupon Otho began to make inroads into the Italian provinces of the Byzantine Empire (Apulia and Calabria), which resulted, in 972, in the marriage of the later Otho II. and Theophano, though the coveted provinces were never surrendered. On May 7, 973, the great Emperor died, and was buried at Magdeburg, which he had made the seat of an archbishop. Otho had restored the prestige of the Imperial power, but it rested on no firm foundation. He was compelled, on account of the absence of a strong middle class, to depend on a party among the higher clergy and great nobles, who, under weaker successors, turned against the Crown. Consult: Vehse, *Kaiser Otto der Grosse* (3d ed., Leipzig, 1867); Köpke and Dönniges, *Jahrbücher des deutschen Reichs unter Otto I.* (Berlin, 1838-39); Köpke and Dümmler, *Kaiser Otto der Grosse* (Leipzig, 1876); Giesebrecht, *Geschichte der deutschen Kaiserzeit*, vol. i. (5th ed., Brunswick, 1881).

OTHO II. (955-83). Holy Roman Emperor from 973 to 983. He was a son of Otho the Great, during whose lifetime (967) he had been crowned as Emperor. In 972 he was married to the Byzantine Princess Theophano. At first Otho was content to rule under the regency of his mother, the Empress Adelaide; but differences having arisen between them, his mother withdrew from all share in the administration. Civil war broke out through the machinations of Henry II. of Bavaria, who formed a secret alliance against the young Emperor; but Otho put down the rebellion in 977. The next scene of war was Lorraine, which the French King, Lothair, had seized as a former appanage of his crown; but here, after a partial defeat, Otho succeeded in reasserting his power in 978, and not content with his advantage, devastated Champagne, pursued and captured Lothair, and advanced upon Paris, one of the suburbs of which he burned. Scarcely was this war ended when the disturbed condition of Italy called Otho across the Alps. His presence put a stop to the insurrection at Milan and Rome, where he reëstablished order; and having advanced into Lower Italy, he defeated the Saracens, drove back the Greeks, and after establishing his supremacy in Apulia and Calabria, which he claimed in right of his wife, Theophano, made himself master of Naples and Salerno, and finally of Taranto, in 982. The Greek Emperor, alarmed at the successful ambition of Otho, called the Saracens again into Italy, who gave him battle with overwhelming numbers. The result was a total defeat of the Emperor at Cotrone. Otho himself narrowly escaped capture by the Saracens, only to find himself on a Greek ship, where he was virtually a prisoner; but as the vessel neared Rossano, a friendly port, he contrived to escape. Otho now hastened to Verona, where a diet was held, which was numerously attended by the princes of Germany and Italy, and at which his infant son Otho was recognized as his successor. This diet is chiefly memorable for the confirmation by Otho of the franchises and privileges of the Republic of Venice, and the enactment of many new laws. Otho's death at Rome, December 7, 983, arrested the execution of the preparations against the Greeks and Saracens, which had been planned at the Diet of Verona, and left the Empire embroiled in wars and internal disturbances. Consult: Giesebrecht, *Jahrbücher des Deutschen Reichs unter der Herrschaft Kaiser Otto II.* (Berlin, 1840); and *Geschichte der deutschen Kaiserzeit*, vol. i. (5th ed., Brunswiek, 1881).

OTHO III. (980-1002). Holy Roman Emperor from 983 to 1002. He was the son of Otho II. and his wife, Theophano, and on his father's death, in 983, was immediately crowned King of the Germans at Aix-la-Chapelle. From this time till 996, when he received the Imperial crown at Rome, the government was administered with extraordinary skill and discretion by three female relatives of the boy King—viz. his mother, Theophano, who died in 991; his grandmother, Adelaide; and his aunt, Matilda, Abbess of Quedlinburg. The princes of the Imperial family disputed the right of these royal ladies to the custody of the young monarch. Henry of Bavaria, the nearest agnate, having seized the person of Otho, tried to usurp the supreme power; but, opposed by the majority of the other princes of the Empire, he was compelled to release him, in consideration of receiving back his forfeited duchy. Otho early showed that he had inherited the great qualities of his forefathers. In 996 he was crowned Emperor by his relative, Gregory V., whom he had raised to the Papal throne, and, having settled the affairs of Italy, returned to Germany. The rebellion of Crescentius, who drove Gregory from the Papal throne, compelled Otho to return to Italy, where success, as usual, attended his measures. Crescentius, who had thrown himself into Sant' Angelo, was seized and beheaded, together with twelve of his chief adherents; the Antipope, John XVI., imprisoned; Gregory restored; and on the speedy death of the latter, Otho's old tutor, Gerbert, Archbishop of Ravenna, raised to the Papacy under the title of Sylvester II., as the first Pope of French nationality. (See SYLVESTER II.) Otho, elated with his success, took up his residence in Rome, where he organized the Government, erected new buildings, and showed every disposition, notwithstanding the ill-concealed dissatisfaction of the Romans, to convert their city into the capital of the Western Empire. Together with Sylvester he dreamed of reëstablishing in full the old Roman Empire, but the insurrection of the Romans frustrated his plans, and, escaping from the city at the risk of his life, he withdrew to Ravenna to await the arrival of reinforcements from Germany; but before they had crossed the Alps, Otho died in 1002 at the age of twenty-two. Consult: Wilman, *Jahrbücher des Deutschen Reichs unter Kaiser Otto III.* (Berlin, 1840); Giesebrecht, *Geschichte der deutschen Kaiserzeit*, vol. i. (5th ed., Brunswick, 1881).

OTHO IV. (c.1175-1218). Holy Roman Emperor from 1198 to 1214. He was the son of Henry the Lion, Duke of Bavaria and Saxony, and Matilda, sister of Richard the Lion-hearted. His father was outlawed by Frederick Barbarossa in 1180, and in the following year was stripped of most of his dominions. Otho and his brother succeeded to a small fragment, the later Brunswick and Lüneburg. Otho was educated at the English Court and participated in Richard's wars against Philip Augustus of France. In 1197 the Emperor Henry VI. died, leaving an infant heir, Frederick II. A majority of the German princes offered the crown to Philip, Duke of Swabia, brother of Henry (1198), but the Guelphs set up Otho as rival King. A civil war resulted, and by 1206 Otho was apparently defeated, but Philip was assassinated in 1208 by Otho of Wittelsbach. Otho of Brunswick was recognized by Innocent III., who crowned him Holy Roman Emperor at Rome in 1209. In 1210 Otho was excommunicated by the Pope because he had seized some Papal territory, and in 1211 some of the German princes deposed Otho in favor of Frederick II., King of Sicily and Naples. After an unsuccessful struggle, and after the defeat at Bouvines (q.v.) by Philip Augustus in 1214, Otho withdrew to his estates in Brunswick, where he passed the last part of his life in penitential exercises. He died May 10, 1218. Consult Winkelmann, *Philip von Schwaben und Otto IV. von Braunschweig* (Leipzig, 1873-78).

OTHO, MARCUS SALVIUS (32-69). Emperor of Rome, from January 15 to April 17, A.D. 69. He was descended from an ancient Etruscan family. He was a favorite companion of Nero, who appointed him Governor of Lusitania, in which office he acquitted himself creditably. On the revolt of Galba against Nero (68), Otho joined himself to the former; but being disappointed in his hope of being proclaimed Galba's successor, he marched at the head of a small band of soldiers to the Forum, where he was proclaimed Emperor, and Galba was slain. Otho was recognized as Emperor over all the Roman possessions, with the exception of Germany, where a large army was stationed under Vitellius. The first few weeks of his reign were marked by an indulgence toward his personal enemies, and a devotion to business, which, though at total variance with his usual habits, excited in the minds of his subjects the most favorable hopes. But the tide of rebellion raised in Germany by Valens and Cæcina during the reign of Galba had by this time gathered strength, and, these commanders having prevailed upon Vitellius to join his forces to theirs, the combined army poured into Italy. Otho possessed several able generals, who repeatedly defeated the rebels; but the prudence of some among them in restraining the enthusiasm of their troops, who wished to follow up their victories, was considered as cowardice or treason, and produced dissensions in Otho's camp. This state of matters, becoming known to the generals of Vitellius, encouraged them to unite their armies and fall upon the forces of Otho. An obstinate engagement took place near the junction of the Adda and the Po, in which the army of Otho was completely routed, and the survivors went over on the following day to the side of the victor. Otho, though by no means reduced to extremity, resolved to make no further resistance, settled his affairs with the utmost deliberation, and stabbed himself, April 17, A.D. 69.

OTHO OF BAMBERG, bäm'bĕrk, SAINT (c.1069-1139). Apostle to the Pomeranians. He was born in the County of Bregenz, became Court chaplain to the Polish Duke Ladislas Hermann, and through his diplomatic duties made the acquaintance of the Emperor Henry IV., who made him his Chancellor, and in 1102 appointed him Bishop of Bamberg. He introduced Christianity into Pomerania, and after his death was canonized.

OTHO OF FREISING, frī'zĭng (c.1111-58). The greatest of the German chroniclers of the Middle Ages. He was an uncle of the Emperor Frederick Barbarossa, was educated at Paris, and, attracted by the ascetic life of the Cistercians, he entered their monastery at Morimond

in 1133. Four years thereafter he was elected abbot, and on the same day became also Bishop of Freising. He always labored hard for his diocese, but also participated in the politics of his day. He joined the Second Crusade, led by Conrad III. of Germany, and in 1150 returned to Europe. Between 1143 and 1146 he wrote his *Chronica*, to which he planned to add the *Gesta Friderici Imperatoris*, but died before the work was finished. His works have been edited by Wilman in the *Monumenta Germaniæ Historica, Scriptores*, vol. xx. (Hanover, 1868); consult, also, the German translation by Kohl in *Geschichtsschreiber der deutschen Vorzeit, XII. Jahrhundert*, vol ix. (Leipzig, 1894).

OTHO OF NORDHEIM, nōrt'hīm (?-1083). A well-known German noble, who played an active rôle in the struggles of the reign of Henry IV. Otho was descended from an old Saxon family, whose seat was near Göttingen. In 1061 Agnes of Poitiers, who was Regent during the minority of her son, Henry IV., gave the vacant Duchy of Bavaria to Otho, in order to gain his aid against the powerful interests arrayed against her. But the Empress was an incapable woman, and in consequence Otho of Nordheim united with the powerful prelates to bring about her downfall. The conspirators obtained possession in 1062 of the young ruler's person and deposed the Empress from the regency. Henry IV. never forgave this deed. When the young King assumed the government in person, Otho was one of the most powerful of the great nobles, and his downfall appeared necessary in order to permit the full development of the Imperial power. In 1070 Otho was suddenly charged with planning a new conspiracy in order to make himself King. Probably the accusation was false, but Otho was found guilty, deprived of his duchy, and was compelled to submit to Henry. He never gave up, however, the attempts to recover his lost territories, and hence was involved in and led the numerous uprisings of the Saxons against Henry IV. In 1077 Otho helped to elect Rudolph of Swabia as German King in opposition to Henry, and when Rudolph fell in battle, in 1080, he supported Hermann of Luxemburg, though he had hoped to obtain the election himself. Otho is important because he is typical of the entire class of great German nobles, who were ever ready to oppose any attempt on the part of the emperors to strengthen their government. Consult: Vogeler, *Otto von Nordheim* (Minden, 1880); Giesebrecht, *Geschichte der deutschen Kaiserzeit*, vol. iii. (5th ed., Leipzig, 1890).

OTIC GANGLION (from Gk. *ōtikós, ōtikos*, relating to the ear, from *oûs, ous*, ear). One of the four cranial sympathetic ganglia, the other three being Meckel's (q.v.), the ophthalmic (q.v.), and the submaxillary (q.v.). The otic or Arnold's ganglion is a small oval, flattened mass, of reddish gray color, situated immediately below the foramen ovale. It is connected with the inferior maxillary branch of the fifth nerve, from which it may receive a motor and possibly also a sensory root. It communicates with the glossopharyngeal nerve, from which it probably derives a sensory root, and with the facial nerve, from which it gets a motor root. Communication with the sympathetic is effected through a filament from a plexus surrounding the middle meningeal artery. It distributes branches to the tensor tympani and tensor palati muscles.

O'TIS, Bass (1784-1861). An American portrait painter, born in New England. He was probably self-taught, and at first painted portraits in New York City. Afterwards, in 1812, he settled in Philadelphia. His "Interior of a Smithy" (1819) is in the Pennsylvania Academy of Fine Arts. It is his only known genre picture. Most of his work was portraiture, and this includes President Jefferson, engraved for Delaplaine's *Portrait Gallery;* Alexander Lawson; the painter Jarvis; himself; and Dr. Physick, of which he made a mezzotint engraving.

OTIS, Elwell Stephen (1838—). An American soldier. He was born at Frederick, Md., but early removed with his family to a farm near Rochester, N. Y., and graduated at the University of Rochester in 1858. Three years later he graduated at the Harvard Law School, and then opened an office in Rochester; but in 1862 he entered the military service of the Federal Government as a captain in the 140th New York Volunteers, and served with them throughout the Civil War, rising to the rank of lieutenant-colonel. He participated in many of the battles of the Army of the Potomac, including Gettysburg and the Wilderness, and was mustered out in 1865 with the brevet rank of brigadier-general of volunteers. The next year he was appointed lieutenant-colonel of the Twenty-second Infantry in the Regular Army, and by successive promotions became colonel in 1880, brigadier-general in 1893, major-general of volunteers in 1898, and major-general in the Regular Army in 1900. In 1898 he was sent to the Philippines, where he relieved Major-General Wesley Merritt as commander of the United States forces and Military Governor of the islands, and in February, 1899, he was brevetted major-general in the Regular Army for "military skill and most distinguished services in the Philippines." He was a member of the first Philippines commission in 1899. In 1900 he was recalled to the United States and assigned to the command of the Department of the Lakes, and in March, 1902, was retired from the service.

OTIS, Fessenden Nott (1825-1900). An American surgeon, born at Ballston Spa, N. Y. He was educated at Union College and at the New York Medical College and the College of Physicians and Surgeons. In the latter institution he was lecturer on genito-urinary diseases (1862-71), and then clinical professor of that subject. He invented many surgical instruments, of which the more important are the urethrometer, the dilating catheter, and an evacuator for use after lithotrity. His works include many monographs on his especial branch, including *Urethral Strictures* (1877) and *Genito-Urinary Diseases* (1883).

OTIS, George Alexander (1830-81). An American military surgeon, born in Boston, Mass. He graduated at Princeton in 1849, and in medicine at the University of Pennsylvania in 1851. In September, 1861, he was appointed surgeon of the Twenty-seventh Massachusetts Volunteers. With them he served until 1864, when he was appointed surgeon of United States Volunteers, and was assigned to duty as curator of the Army Medical Museum and custodian of the Division of Surgical Records at Washington.

On the conclusion of peace he accepted an appointment as assistant surgeon in the medical corps, and continued his duties at the museum, which, owing to his zeal and energy, came to possess the most valuable surgical and anatomical collections in the world. He compiled the surgical volumes of the *Medical and Surgical History of the War* (1870-81), contributed frequently to medical publications, and for three years edited the *Richmond Medical Journal*. Among his writings are *Excision of the Head of the Femur for Gunshot Injury* (1869) and *Amputation of the Hip-Joint in Military Surgery* (1867).

OTIS, HARRISON GRAY (1765-1848). An American lawyer and politician. He was born in Boston, graduated at Harvard in 1783, was admitted to the bar three years later, and soon became one of Boston's most eloquent orators. In 1796 he was elected to the State Legislature, and the next year was sent to Congress as a Federalist. After the expiration of his term he was chosen to fill a number of State offices, and became one of the most popular politicians in Massachusetts. His popularity was greatly diminished, however, by the active part he took in the Hartford Convention (q.v.), though he was afterwards elected United States Senator (1817) and Mayor of Boston (1829). His brilliant oratorical powers made him a leader in the Senate, where he opposed the further extension of slavery. Criticism of the Hartford Convention led him to publish a series of *Letters in Defense of the Hartford Convention and the People of Massachusetts* (Boston, 1824). Consult Loring, *The Hundred Boston Orators* (Boston, 1854).

OTIS, JAMES (1725-83). An American statesman of the Revolutionary period. He was born, February 5, 1725, at West Barnstable, Mass.; graduated at Harvard in 1743, and studied law in the office of Jeremiah Gridley. He practiced for two years at Plymouth, but settled in 1748 in Boston, where he soon rose to the front rank in his profession. In 1761, when he was Advocate-General, application was made to the Massachusetts Supreme Court for writs of assistance, i.e. general search warrants for the discovery of smuggled goods imported into the colony. Otis was convinced of the illegality of these writs, and resigned his office rather than argue in their defense. He was immediately engaged to argue against them, which he did in a speech of great force and eloquence. It was of this speech that John Adams said "American independence was then and there born." The judges reserved their decision, but no more writs were enforced, though some were issued. The resignation of Otis and his plea in behalf of the popular side of the writs-of-assistance controversy gave him a high reputation for patriotism, ability, and eloquence, which he more than maintained in the Legislature, to which he was elected the same year. Taking an active part in the legislative discussions upon taxation and representation, he became still more conspicuous by publishing in the following year, 1762, his *Vindication of the Conduct of the House of Representatives*, which has been considered one of the sources from which all the arguments against Parliamentary taxation were later drawn, and the basis of all subsequent treatises on free speech in America and France. This was followed, in 1764, by his *Rights of the British Colonies Asserted and Proved*. His apparent recognition of Parliamentary supremacy in this pamphlet, however, served to quality the regard in which he had been held by the extremists. In a third pamphlet, entitled *Considerations on Behalf of the Colonists*, published the following year, he reëstablished himself in the esteem of the radicals. On June 6, 1765, he made a motion, which was carried, that a congress of representatives from the various colonies should be convened. In pursuance of this measure a circular letter was sent, inviting the colonies to join in a congress, and the Stamp Act Congress, which met in New York in the fall of 1765, was the result. Otis took part in the proceedings of this body, and served on the committee which framed an address to the House of Commons. He was chosen Speaker of the Massachusetts General Court in 1766, but the Governor interposed his negative then, as also in the following years. In 1768, after the passage through Parliament of Charles Townshend's bill for the taxation of the colonies, the Massachusetts General Court sent a second circular letter to the other colonies, calling on them to join in some common plan for protection. It was in answer to the message of Bernard, the Royal Governor, demanding that the circular be recalled, that Otis made a notable speech, condemned by the partisans of the Crown as "the most violent, insolent, abusive, and treasonable declaration that perhaps was ever delivered." Only seventeen members voted to recall the circular. In 1769 the customs commissioners accused him in England of treason. This coming to his notice, he publicly denounced the commissioners in the Boston *Gazette*. Meeting Robinson, one of the commissioners, in a coffee-room the next night, he became involved in a dispute with him. An affray resulted, in which Otis received a cut on the head, which is supposed to have been the cause of his subsequent insanity. He sued Robinson, and recovered £2000 damages, but relinquished this sum in consideration of a written apology from Robinson. After a short residence in the country for the benefit of his health, he returned to the Legislature in 1771. He was insane for the greater part of his subsequent life, with the exception of a short interval, when he went back to Boston and resumed the practice of his profession. The last two years of his life were spent at Andover, where he was killed by lightning, May 23, 1783. He published in 1760 a treatise on *The Rudiments of Latin Prosody; with a Dissertation on Letters and the Principles of Harmony in Poetic and Prosaic Composition*. Of his public career the elder Adams said: "I never knew a man whose love for his country was so sincere; never one who suffered so much; never one whose services for any ten years of his life were so important or so essential to the cause of his country as those of Mr. Otis from 1760 to 1770." His *Life* has been written by William Tudor (Boston, 1823); also by Francis Bowen (Boston, 1847). Also consult Tyler, *Literary History of the American Revolution* (New York, 1897).

OTI'TIS ME'DIA (Neo-Lat., inflammation of the middle ear). An inflammation of the structures of the tympanic cavity of the ear. It may be acute or chronic. There is an effusion of

fluid into the middle ear, which may be serous (the catarrhal form) or this may become infected with pus-producing organisms (the purulent forms). It arises from exposure to cold or wet, the introduction of fluids into the middle ear through the Eustachian tube while bathing, or through douching the nose, or by extension of inflammatory processes from the nose and throat. It often begins in this way during the course of the infectious fevers, particularly in scarlatina, when it is of the purulent type. The symptoms of the acute form are sudden and intense pain in the ear, increased by coughing, sneezing, or swallowing, *tinnitus aurium*, or singing or buzzing noises heard by the patient, and more or less deafness. If the disease goes on unchecked, suppuration takes place, and the membrance of the tympanum ulcerates, and allows of the discharge of pus. Inflammation of the dura mater and abscesses in the brain may result. The chronic form of the disease may be *catarrhal* (without suppuration) or *purulent*; in the latter there is a persistent discharge (see OTORRHŒA) of pus from the external ear. The catarrhal form often comes on insidiously and results in complete or partial deafness in the ear affected, unless arrested by treatment. The management of so serious an affection must be left solely in the hands of the medical practitioner. See EAR, section on *Diseases*.

OTO, ō'tō. A small tribe of Siouan stock formerly holding the territory west of the Missouri and south of the Platte, in southeastern Nebraska, and now residing, together with the Missouri, upon a reservation in eastern Oklahoma. The two tribes speak the same language and have been confederated since the early part of the nineteenth century. They formerly lived in circular earth-covered log houses, and about a century ago, before they were joined by the Missouri, had several villages, with an estimated population of 800. Both tribes have dwindled rapidly, the two together numbering only 460 in 1875 and 370 in 1900.

OTOCYON (Neo-Lat., from Gk. *oûs, ous*, ear + κύων, *kyōn*, dog). A genus of wild dogs, which differs from other genera of Canidæ primarily in having an additional molar in each jaw, and other peculiarities of dentition. The genus contains only one species, *Otocyon megalotis* of Africa. See LALANDES FOX-DOG.

OTOMACO, ō'tō-mä'kō. A savage tribe, apparently constituting a distinct linguistic stock, living in the forests of the Orinoco, about the junction of the Meta, in Central Venezuela. They are in a very low state of culture, but are monogamous and allow their women an equality in tribal ceremonies. They are addicted to the eating of a certain oily clay.

OTOMI, ō-tō'mē (Nahuatl *otomitl*, wanderer). An ancient people of Central Mexico, antedating the coming of the Aztec, by whom they were subjugated. They call themselves *Hia-hui*, and their tribes, constituting a distinct linguistic stock, occupied most of Querétaro and Guanajuato, with considerable portions of Hidalgo, Michoacán, and Mexico State. They are rather below medium stature and darker in color than the neighboring tribes, but appear to have been fully up to the standard in intelligence, living by agriculture, wearing cotton clothing of their own weaving, skillful in the working of gold, copper, and stone, and noted for their songs and musical ability, and their religious ceremonials. They defeated several Spanish expeditions against them and were not finally reduced to submission until 1715. They still form a considerable and valuable portion of the population of the States named, and retain their own language, which, by reason of its monosyllabic character and peculiar sounds, was at one time erroneously thought to be connected with the Chinese.

OTÓN, ō-tōn'. A town of Panay, Philippines, in the Province of Iloilo, situated on the south coast, six miles west of Iloilo (Map: Philippine Islands, G 9). Population, 13,363.

OTORRHŒ'A (Neo-Lat., from Gk. *oûs, ous*, ear + *roia, rhoia*, a flow, from *ῥεῖν, rhein*, to flow). A purulent or muco-purulent discharge from the external ear. It may be acute or chronic, and, while it may be due to a polypus or an abscess in the canal, it is, as a rule, an evidence of otitis media (q.v.). The treatment is that of the inflammation of the middle ear, which causes it. See EAR, section on *Diseases*.

OTRANTO, ō-trän'tō (Lat. *Hydruntum*). A town on the southeast coast of Italy, in the Province of Lecce, 24 miles southeast of Lecce by rail (Map: Italy, N 7). It has a cathedral, recently restored, and a castle. The chief industries are fishing and the manufacture of fishing nets and oil. During the Middle Ages it was the chief port of Italy on the Adriatic, whence passengers took ship for Greece. It was destroyed by the Turks in 1480. Population (commune), in 1901, 2401.

OTRANTO, STRAIT OF. The passage connecting the Adriatic with the Ionian Sea (Map: Italy, N 7). It is a construction of the large arm of the Mediterranean which separates the Italian from the Balkan Peninsula, and has a minimum width of 45 miles between the town of Otranto in Italy and Cape Linguetta in Turkey.

OTRANTO, THE CASTLE OF. A novel by Horace Walpole. See CASTLE OF OTRANTO.

O'TRIG'GER, Sir LUCIUS. In Sheridan's *Rivals*, an Irish fortune-hunter, honest and always ready for an opportunity to fight.

OTSE'GO BASS. A landlocked variety of the common whitefish (q.v.), found in Otsego Lake, at the head of the Susquehanna River.

OTSEGO LAKE. A small lake in Otsego County, central New York (Map: New York, E 3). It is the main source of the Susquehanna River. Cooperstown lies at its southern end.

OTTAVA RIMA, ôt-tä'vä rē'mä (It., octuple rhyme). The name given by the Italians to a stanza, composed of eight five-foot lines, rhyming ab ab ab cc. This stanza has been employed by English poets, notably by Fairfax in his translation of Tasso's *Jerusalem Delivered*, by Spenser in *Muiopotmos*, and by Byron in *Don Juan*. It is also the basis of two well-known English verse-schemes. The seven-line stanza (ab ab b cc) called rhyme royal, which was employed by Chaucer and his followers and was revived by later poets, as William Morris, is the *ottava rima* with the fifth line dropped out. The so-called Spenserian stanza—that of the *Faerie Queene*—is also a modification of the *ottava rima*. Consult Alden, *English Verse* (New York, 1903).

OTTAWA, ŏt'ă-wă. An important Algonquian tribe originally living about the upper Ottawa River, Canada, and carrying on an active trade by water between the Eastern tribes and those of the lakes. They were the allies and friends of the French and the Huron, by which they incurred the hatred of the Iroquois. After the dispersion of the Huron, about 1645, the Iroquois turned against the Ottawa, who were compelled to abandon their country and seek refuge on Manitoulin Island in Lake Huron. After a short stay there they removed, about 1660, to La Pointe (Wis.), on the south shore of Lake Superior, where the Huron had already preceded them. Here the Jesuits resumed their mission work, but a few years later the two tribes were again driven out by the Sioux, the Huron retiring to Mackinaw, while the Ottawa returned to Manitoulin Island. Within the next fifty years they had spread over the whole of Lower Michigan and into adjacent parts of Ohio and Illinois, besides holding Manitoulin and some territory on the Canadian side of Lake Huron. They took an active part on the French side in all the colonial wars, including that headed by Pontiac, who was himself of that tribe. They joined the English side against the Americans in the Revolution and War of 1812. Several smaller bands have been removed to the West, but the great body of those in the United States are still living in small settlements scattered over Lower Michigan, having no regular reservation. Those in Canada are all within Ontario Province.

In their general characteristics the Ottawa closely resemble the Ojibwa, and according to tradition these two tribes and the Potawatami formed one body before their westward migration. The number of their clans is disputed, but the principal one seems to have been the Otter. Owing to their being scattered in numerous small bands over a large territory, intermixed with other tribes, no reliable estimate of their separate population has ever been made, but it is probably at present about 5000.

OTTAWA. The capital of the Dominion of Canada and of Carleton County, Ontario, at the junction of the Ottawa and Rideau rivers, on the Canadian Pacific, the Canadian Atlantic, the Ottawa and New York, and several other railroads, 101 miles west of Montreal (Map: Canada, P 7). It communicates by steamer on the Ottawa with Montreal, and by the Rideau Canal with Lake Ontario at Kingston. At the west end of the city the Ottawa rushes over the magnificent cataract known as the Chaudière Falls; and at the northeast end, divided by Green Island, there are two other cataracts, over which the Rideau falls into the Ottawa. The scenery around Ottawa is scarcely surpassed by any in Canada. The immense water power is made use of in foundries, factories, flour-mills, and in several saw-mills, which give Ottawa its principal trade in enormous quantities of sawed timber. A railway bridge and a road bridge which has supplanted the suspension bridge over the Chaudière Falls connect Ottawa with Hull (q.v.), in the Province of Quebec. Four bridges span the Rideau River.

Ottawa's streets are wide and laid out at right angles. Among its chief features are the Parliament and departmental buildings on Parliament Hill, 125 feet above the river, magnificent structures built of Canadian and New York sandstone, which cover nearly four acres, and cost about $4,000,000. The style of architecture is the Italian Gothic; the south front of the quadrangle is formed by the Parliament building, 500 feet long. Other buildings include the Basilica or Roman Catholic Cathedral of Notre Dame, Christ Church Cathedral, the city hall, post-office, Rideau Hall, the Governor's residence, numerous churches, the Ottawa Roman Catholic University, the Coligny Ladies' College, a collegiate institute and normal school, and several charitable and benevolent institutions. The Public or Parliamentary Library contains over 200,000 volumes, and there are also an interesting museum and a national art gallery. The city maintains several fine parks, has water, gas, and electric lighting plants, electric street railroads, and a modern system of sewerage. It is the residence of the Governor-General of Canada, the seat of a United States consul-general, and the see of the Roman Catholic Archbishop of Ottawa, and of the Anglican Bishop of Ontario. Ottawa was founded in 1827 by Colonel By, from whom it was named Bytown; was incorporated as a city under its present name in 1854; and was selected by Queen Victoria as the capital of Canada in 1858. Population, in 1891, 44,156; in 1901, 59,902.

OTTAWA. A city and the county-seat of La Salle County, Ill., 85 miles southwest of Chicago; at the junction of the Fox and Illinois rivers, on the Illinois and Michigan Canal, and on the Chicago, Rock Island and Pacific and the Chicago, Burlington and Quincy railroads (Map: Illinois, D 2). It is the seat of Pleasant View College (Lutheran), and of Saint Francis Xavier Academy. It has a high school library, Illinois Appellate Court, Odd Fellows' and Reddick's public libraries; the Ryburn Memorial Hospital; and Washington, Shabbana, Ellis, and Allen parks. Ottawa controls important commercial interests, and possesses valuable natural advantages in deposits of coal, clay, and glass sand. Its extensive manufactures include glass ware, chimney glass, pottery, fire brick, tile, sewer pipe, organs, pianos, carriages, wagons, buggies, agricultural implements, collars and harness, etc. The government is administered, under a general law of 1871, by a mayor, elected every two years, and a council which confirms the executive's appointments of subordinate officers. The school officials are independently elected by popular vote. The municipality owns and operates the water-works and owns the electric light plant, the power being furnished by a private company. Ottawa was incorporated as a town in 1837. Population, in 1890, 9985; in 1900, 10,588.

OTTAWA. A city and the county-seat of Franklin County, Kan., 55 miles southwest of Kansas City; on the Marais des Cygnes River, and on the Atchison, Topeka and Santa Fe, the Southern Kansas, and the Missouri Pacific railroads (Map: Kansas, G 3). It is the seat of Ottawa University (Baptist), organized in 1865; and has a free Carnegie Library, Forest Park, and, among prominent buildings, the county courthouse, First Baptist Church, First Methodist Episcopal Church, and Rohrbaugh Theatre. The city controls important commercial interests in a trade in grain, wool, and live stock. The principal industrial plants are the railroad machine shops of the Southern Kansas, large nurseries,

flouring mills, grain elevators, a foundry, carriage factories, soap works, a creamery, etc. The government is administered under a charter of 1867, which provides for a mayor who holds office for two years, and a council. Population, in 1890, 6248; in 1900, 6934.

OTTAWA. A village and the county-seat of Putnam County, Ohio, 52 miles south-southwest of Toledo; on the Blanchard River, and on the Detroit Southern, the Cincinnati, Hamilton and Dayton, and the Findlay, Fort Wayne and Western railroads (Map: Ohio, B 3). It is the centre of a farming and stock-raising country which has valuable forests. There are manufactures of lumber in various products, flour, clay, shingles, etc. Population, in 1890, 1717; in 1900, 2322.

OTTAWA RIVER. The principal tributary of the Saint Lawrence. It rises 160 miles north of Ottawa, on the Laurentian divide, and flows first west, then southeast and east, until after a course of about 600 miles it falls into the Saint Lawrence by two mouths, which form the island of Montreal (Map: Canada, P 7). During its course it widens into numerous lakes of considerable size, and is fed by many important tributaries, such as the Madawasca and Rideau on the right, and the Gatineau and the Rivière du Lièvre on the left. These, with the Ottawa itself, form the means of transit for perhaps the largest lumber trade in the world, while the clearing of the lumber has opened the country for several thriving agricultural settlements. The navigation has been greatly improved, especially by the construction of dams and slides to facilitate the passage of timber over falls and rapids. The Ottawa is connected with Lake Ontario at Kingston by the Rideau Canal, and is navigable for 250 miles. For a great part of its course it forms the boundary between the provinces of Ontario and Quebec.

OTTENDORFER, Oswald (1826-1900). A German-American journalist. He was born at Zwittau, Moravia, studied jurisprudence at Vienna, and was among those German youth who, after participating in the revolutionary troubles of 1848, sought refuge in America. Coming to New York, he acquired control of the *New-Yorker Staats-Zeitung*, which, at first Democratic in politics, but after 1871 independent, has taken rank as the foremost German-American daily. He largely endowed various institutions in his native town of Zwittau, and to New York presented a fully equipped free library. Some years previous to his death ill health necessitated his retirement from active journalistic work.

OTTER (AS. *otor, ottor, oter*, OHG. *ottar*, Ger. *Otter*, otter; connected with OChurch Slav. *vydra*, Lith. *udra*, otter, Gk. *ὕδρος, hydros, ὕδρα, hydra*, water-snake, Skt. *udra*, otter, also with Gk. *ὕδωρ, hydōr*, Skt. *udan*, water, and ultimately with Eng. *water*). The otters are a small but cosmopolitan subfamily (Lutrinæ) of fur-bearing carnivores (Mustelidæ), with aquatic habits. The North American otter (*Lutra Canadensis*) is found in most parts of the continent north of Mexico, though no longer numerous in well-settled districts. It is about four feet in length, of which the tail is one-third. The color is rich brown. The body is long, and rather stout, the legs short with rounded webbed feet, the tail broad and horizontally flattened, and the skull wide and depressed. The eyes are small and supplied with a nictitating membrane. The teeth are strong and very sharp. The whole structure is thus adapted to an aquatic life and the capture of fish. The otter makes its home in some hole in the bank, or under the roots of a tree, furnished with a bed of leaves and grass, where the female brings forth from one to three young ones, in the early spring. Although ill-shaped for walking on land, otters wander about a great deal at night, crossing from one stream to another, and doing much hunting in the woods and thickets; and young and old are fond of romping games in grassy places in summer, as well as in the snowbanks of winter. The otter is one of the most playful of animals, and many writers have described its favorite pastime of sliding on the inclines of snow or in summer on some steep clayey slope entering a body of water. In either case the otter lies on its belly with its fore feet bent backward, and gives the body a shove by means of its hind feet. In a short time the sliding place becomes very slippery and the otters show great delight in sliding down and then climbing back to repeat the performance. In captivity otters are rather surly and snappish, and when brought to bay in their native haunts they will fight savagely, and it requires a special breed of dogs (see Hound) to hunt them successfully. In India and the Far East the otter is frequently kept in a half-domesticated state and used as a fish-catcher. A collar is placed around the neck and to this a long line is attached. The otter is then sent into the water, and as otters always bring their prey to shore to devour it, as soon as he has captured a fish he returns to his master with it.

The European otter (*Lutra vulgaris*) is widely distributed throughout Europe and Asia. It is much smaller than the American species and somewhat lighter in color. It is frequently seen along the seashore and fishes in the sea. Other species of Lutra occur in Southeastern Asia, in Africa, and in South America.

The fur of the otter is highly prized and is an important article of commerce. The flesh has a very fishy taste, and has been accounted by many Roman Catholics as fish and not meat, so that it might be used in Lent and on fast days. A discussion of this mediæval view is one of the entertaining disquisitions in Walton's *Compleat Angler*.

Consult British and East Indian books of zoology and sport; Thomas, *Proceedings of the Zoölogical Society* (London, 1889); Stone and Cram, *American Animals* (New York, 1902). See Plate of Minor Carnivores. Compare Coypu.

OTTER (or **ANCON**) **SHEEP.** An aberration or sport of the ordinary breed of sheep, which by artificial selection became the founder of a distinct breed. Seth Wright, a farmer of Dover, Mass., kept a flock of 15 ewes and one ram. In 1791 one of the ewes produced a male lamb, which after growing up was reserved for breeding purposes, the original ram being killed. In the first season "two lambs only were yeaned in his likeness," but the number grew, until there resulted a small flock of the strongly marked sport, called 'otter breed,' and named 'ancon,' by Dr. Shattuck, from the crookedness of its short fore legs, causing them while walking to appear like elbows. The body was longer than normal, the legs shorter and crooked, and the breed appears to have

been perpetuated on account of its being less able than ordinary sheep to jump over fences. The interest in this sport is due to the fact that one prepotent sire impressed his peculiarities on his offspring and became the founder of a new breed. When an ancon ewe was mated with a common ram, the increase resembled "wholly either the ewe or the ram." Moreover, frequent instances happened where common ewes had twins by ancon rams, when one exhibited the complete marks and features of the ewe, the other of the ram. The ancons were observed to keep together, separating themselves from the rest of the flock when put into inclosures with other sheep. This fact is a noteworthy instance both of the results of isolation (q.v.) and of preferential mating. After the introduction of Merinos, which are equally gregarious, quiet, and orderly, the ancon breed became extinct; in fact, it was difficult for Humphreys to procure one in 1813 for dissection by Dr. Shattuck. Without doubt the breed immediately after the above date was bred out or swamped by intercrossing with the ordinary breed of sheep. See CROSS-FERTILIZATION; PREPOTENCY. Consult D. Humphreys, "On a New Variety in the Breeds of Sheep," in the *Philosophical Transactions of the Royal Society* for 1813 (London, 1813).

OT'TER, WILLIAM DILLON (1843—). A Canadian soldier. He was born in the Province of Ontario, and was educated at Upper Canada College, Toronto. He saw service in the Fenian raids in 1866, and from 1883 to 1889 was commandant of the School of Infantry in Toronto. During the second Riel rebellion, in 1885, he commanded a column under General Middleton, and was in command at the battle of Cut Knife Creek. In 1886 he was appointed commanding officer of the Second District, and in 1896 an inspector of infantry. His most notable service was during the Boer War in South Africa, in which he was in command of the First Canadian contingent.

OT'TERBEIN, PHILIP WILLIAM (1726-1813). A clergyman, founder of the United Brethren in Christ (q.v.). He was born at Dillenburg, Germany, and studied the classics and theology at his father's school at Herborn. After being ordained at The Hague he sailed for America to take up the work of the ministry in the German Reformed Church. He first settled at Lancaster, Pa., where he remained till 1758. He then held pastorates at Tulpehocken, Pa., Frederick, Md., and York, Pa. In 1774 he accepted a call to a new congregation in Baltimore, and remained there until his death. In 1768 he became associated with Martin Boehm, a Mennonite preacher, and their labors resulted in the organization of the Church of the United Brethren in Christ. The common belief that he was its first bishop or superintendent is denied by Harbaugh (*Fathers of the German Reformed Church*, Lancaster, Pa., 1857), who maintains that Otterbein, who never really left the German Reformed Church, bears the same relation to the new organization that Wesley does to Methodism. Consult his *Life* by Drury (Dayton, Ohio, 1884).

OTTERBEIN UNIVERSITY. A coeducational college at Westerville, Ohio, founded in 1847, under the control of the United Brethren in Christ. It has a preparatory department, a college with two courses, classical and philosophical, and graduate, normal, art, and music departments. It had, in 1903, a library of 11,000 volumes, a student attendance of 365, and 29 instructors. Its endowment was about $100,000, and the gross income $60,000; the value of the college property was estimated at $250,000, and that of the buildings and grounds at $95,000.

OT'TERBURN, BATTLE OF. A battle commemorated by the ballad of Chevy Chase (q.v.).

OTTER CREEK. A stream rising in south-central Vermont, and flowing northwestward 90 miles through a picturesque country, emptying into Lake Champlain near its southern extremity (Map: Vermont, A 5). It is navigable eight miles to Vergennes, and supplies good water power.

OTTER-DOG, or OTTER-HOUND. See HOUND.

OTTER SHELL. A large edible mactroid clam (*Lutraria maxima*) of the Northwestern American coast.

OTTER SHREW. A West African insectivore or kind of shrew (*Potamogale velox*), which resembles an otter, lives in clear streams, and swims with great rapidity and strength, the union of the second and third toes serving the purpose of webbing. It is larger than a weasel, dark-brown in color, and has a long compressed tail, of much assistance in swimming. It has been described as living upon fish, but little is known of its habits or food. With a small and somewhat similar Madagascar animal (*Geogale aurita*) it constitutes the family Potamogalidæ.

ÖTTINGEN, ö'ting-en, ARTHUR VON (1836—). A German physicist and writer on the theory of music. He was born in Dorpat, and, after studying there and in Berlin, became professor (1865) of physics in the University of Dorpat, whence, in 1893, he went to Leipzig as docent, becoming full professor in 1894. While he was in Dorpat, Oettingen devoted himself especially to meteorology and thermometric studies; founded a meteorological observatory in 1866, and wrote: *Die Korrektion der Thermometer, insbesondere über Bessels Kalibriermethode* (1865); *Meteorologische Beobachtungen, 1866-75* (1868-77); and on musical theory, *Harmoniesystem in dualer Entwicklung* (1866). He was an editor of Oswald's *Klassiker der exakten Wissenschaften*, and, with Feddersen, of the third volume of Poggendorf's *Biographisch-litterarisches Handwörterbuch, 1858-93* (1898). His later work includes *Elemente des geometrisch-perspektivischen Zeichnens* (1901).

ÖTTINGER, ö'ting-er, EDUARD MARIA (1808-72). A German author and humorist, born in Breslau. He published several comic papers and wrote many novels, among which may be mentioned: *Der Ring des Nostradamus* (3d ed., 1853); *Ein Dolch oder Robespierre und seine Zeit* (3d ed., 1862); and *König Jerome Napoleon und sein Capri* (2d ed., 1861). He also published several historical and bibliographical works, including *Bibliographie biographique* (2d ed., 1854) and *Geschichte des dänischen Hofs* (1857-59).

OT'TO. The name of German rulers. See OTHO.

OTTO I. (1815-67). King of Greece from 1833 to 1862. He was the second son of Louis I., King of Bavaria, and was born at Salzburg, June

I. 1815. In August, 1832, the throne of Greece was offered to him by the Greek National Assembly, and in the following year he began his reign under a regency. In June, 1835, he assumed personal power, and in the following year he married in Germany the Princess Amalie of Oldenburg. A monetary crisis, which was provoked partly by false administrative measures, threw the affairs of Greece into confusion, and materially weakened the King's popularity. A national reaction against the Germanizing tendencies of the Court followed, and resulted, in 1843, in a military revolution, which forced a constitution upon the King. The Bavarian ministers were dismissed, but the King and his Greek advisers attempted in various ways to curtail the privileges which the new Constitution had conferred on the people. The equivocal position in which he was placed during the Crimean War between the allied powers on the one hand, and his subjects, who were strongly in favor of Russia, on the other, increased the difficulties of his situation. The Queen's pro-Russian sympathies made her for some time a favorite; but the belief that Otto's absolute measures were due to her instigation turned the tide of popular hatred so strongly against her that attempts were made on her life. The general discontent at last found vent in insurrections at Nauplia and Syra in 1862, which were soon suppressed. A more formidable insurrection in the districts of Acarnania, Achai, and elsewhere broke out in October of the same year, and in a few days extended to the whole of Greece. Otto fled to Salamis, from which place he issued a proclamation declaring that he quitted Greece to avoid civil war. He never formally renounced his right to the Greek throne. He died at Bamberg, July 26, 1867.

OTTO, Julius (1804-77). A German composer. He was born at Königstein, in Saxony, and studied music in Dresden and Leipzig. From 1830 to 1875 he was teacher of music and cantor at the Kreuzkirche in Dresden. His popular songs include the cycles for male voices, "Gesellen- und Burschenfahrten," and "Soldatenleben." He wrote three oratorios, *Des Heilands letzte Worte*, *Die Feier der Erlosten am Grabe Jesu*, and *Hiob;* but his male choruses and pianoforte compositions embody his best work.

OTTO, Paul (1846-93). A German sculptor, born in Berlin, where he frequented the Academy and the studio of Karl Begas. Having received the first prize in a competition for the Tegetthoff monument in Vienna, in 1873, he went to Italy, and during a thirteen-years' sojourn in Rome produced, among other works, the marble statues for Berlin of "Wilhelm von Humboldt" (garden in front of the University) and of "Chodowiecki" (Vestibule of Old Museum), and the polychrome statue of a "Vestal" (1886, National Gallery). His "Luther Monument," with many accessory figures (Neuer Markt, Berlin), in the competition for which he had carried off the first prize (1886), was completed after his death by Toberentz.

OTTOKAR II. (c.1230-78). King of Bohemia from 1253 to 1278. He was a son of Wenceslas I. and Princess Kunigunde of the House of Hohenstaufen. In 1251, after the extinction of the line of Babenberg, he obtained possession of the Duchy of Austria and married Margaret, the sister of the deceased Duke. He came to the Bohemian throne on the death of his father, and the next year he took part in a crusade against the heathen Prussians, whom he defeated; he founded Königsberg in their territory. In 1260 he gained a victory over the Hungarian King, Béla IV., on the Marchfeld, and annexed Styria in 1261. The same year he procured a divorce from Margaret, and married the Russian Princess Kunigunde, who was a grandchild of Béla. The duchies of Carniola and Carinthia fell to him in 1269, and he made some small additional acquisitions in 1271 and 1272. Ottokar was now one of the most powerful princes in Europe. When Rudolph of Hapsburg (q.v.) was elected Emperor, Ottokar refused to recognize him. After long negotiations he was put under the ban of the Empire and defeated in battle (1276), and was compelled to give up all his possessions except Bohemia and Moravia. He soon renewed the war and perished on the Marchfeld, August 26, 1278. Ottokar founded cities and encouraged commerce and manufacturing. He attempted to weaken the feudal nobility and to destroy their castles. Consult: Lorenz, *Geschichte Königs Ottokar II.* (Vienna, 1866); and Huber, *Geschichte Oesterreichs*, vol. i. (Gotha, 1885).

OTTOKAR OF STYRIA (c.1250-c.1310). A German chronicler, sometimes erroneously called Ottokar 'of Horneck.' He wrote in about eighty-three thousand verses, filled with descriptions of tourneys, fêtes, and battles, a very valuable history of Styria from 1230 to 1309, which has especial importance as supplementing our knowledge of Rudolph of Hapsburg, Ottokar of Bohemia, Adolphus of Nassau, and Albert I. It is edited by Seemüller in the *Monumenta Germaniæ Historica*, vol. v., pts. 1 and 2 (Hanover, 1890, 1893). Consult Busson, "Beiträge zur Kritik der steirischen Reimchronik," in the *Sitzungsberichte* of the Vienna Academy (1885-92).

OTTOMAN EMPIRE. A common designation for Turkey. The beginning of the Ottoman power is usually traced back to Ertogrul, chief of a Turkic tribe, who in the beginning of the thirteenth century established himself in the ancient Phrygia. From his son Othman, or Osman (1288-1326), the Empire derives its name. Notable successors of Othman were Amurath, or Murad I. (1359-89), who organized the Janizaries and took Adrianople in 1361; Bajazet I. (1389-1403), who was victorious over the Christians, but succumbed to Timur; Mohammed II. (1451-81), who took Constantinople in 1453; Bajazet II. (1481-1512), celebrated for his magnificence; his son Selim I. (1512-20), who conquered Syria and Egypt; Solyman II. (1520-66), under whom the Empire attained its zenith, and Mohammed IV. (1648-87), whose able minister, the celebrated Kiuprili (q.v.), by repeated victories, vigorously sustained the declining fortunes of the Empire. Under the succeeding monarchs the Empire underwent a rapid diminution before the steady advance of the Austrian and Russian armies, until its preservation in the nineteenth century came to depend upon the goodwill of certain European powers and the jealousies of all. The Ottoman Empire remains, with Russia, the only despotism in Europe in spite of reforms begun under Mahmud II. (1808-39), and the charter of liberties granted by his

successor Abd-ul Medjid in the celebrated Hatti-Sherif of Gulhane in 1839. See TURKEY.

OTTO OF ROSES. See ATTAR OF ROSES.

OTTUMWA, ŏ-tŭm'wȧ. A city and the county-seat of Wapello County, Iowa, 81 miles southeast of Des Moines, on the Des Moines River, and on the Iowa Central, the Wabash, the Chicago, Burlington and Quincy, the Chicago, Milwaukee and Saint Paul, the Chicago, Rock Island and Pacific, and other railroads (Map: Iowa, E 4). Among the notable structures of the city are the United States Government building, opera house, Y. M. C. A. building, the Union railway station, public library, the public school buildings, and the court-house. Ottumwa is the centre of productive coal fields, and has abundant water power—two important factors in the development of its extensive manufactures. The industrial establishments include iron works, foundries, a large pork-packing plant, agricultural and mining implement works, furniture factories, etc. The city has good transportation facilities and important commercial interests. Settled in 1849, Ottumwa was incorporated two years later. The government, under a charter of 1892, is vested in a mayor, biennially elected, and a council, a small minority of whose members are elected at large. Population, in 1890, 14,001; in 1900, 18,197.

OTUMBA, ŏ-tum'bȧ. A town of Mexico, in the State of Mexico, 31 miles northeast of the capital, on the Mexican Railway (Map: Mexico, K 8). It is on the site of the ancient Indian village Otompan, where Cortés, in one of the bloodiest battles of the Conquest, defeated the Aztecs after his disastrous retreat from the City of Mexico. Its population, in 1895, was about 2000.

OT'WAY, THOMAS (1652-85). An English dramatist, author of *The Orphan* and *Venice Preserved*, two plays long famous on the British stage. He was born March 3, 1652, at Trotton, near Midhurst, Sussex. Leaving Oxford without a degree, he went to London to seek his fortune in 1671. He appeared on the stage, but made a signal failure; next he applied himself to dramatic composition. In 1675 *Alcibiades*, his first tragedy, was printed; and in the following year he produced *Don Carlos*, a play which was extremely popular. His first comedy, *Friendship in Fashion*, appeared in 1678, and met with general appreciation. After a time spent with the army in Holland, he produced the tragedy of *Caius Marius* in 1680. In the same year *The Orphan* met with an extraordinary, and, in some respects, a deserved success. In 1681 *The Soldier of Fortune*, and in 1682 the finest of all his plays, *Venice Preserved*, were produced. From this time till his death, the poet had much to endure from poverty and neglect. Debts accumulating upon him, he retired to an obscure public-house on Tower Hill, for the purpose of avoiding his creditors, and here, at the early age of thirty-three, he died, April 14, 1685. Otway's power lay chiefly in depicting the pathos of affection, and he may have been inspired by his own unhappy infatuation for Mrs. Barry, the actress. Otherwise, although he achieved a brilliant reputation during his lifetime, and though he is described by Dryden as having a power of moving the passions which he himself did not possess, Otway's plots are artificial, and his work is of inferior artistic value. Consult: Johnson, *Lives of the Poets* (new ed., London, 1896); *The Works of Thomas Otway*, with *Life*, by Thomas Thornton (ib., 1813); Ward, *History of English Dramatic Literature* (ib., 1899); Gosse, *Seventeenth Century Studies* (ib., 1883); Noel, *Best Plays of Thomas Otway* (ib., 1888); De Gris-y, *Etude sur Thomas Otway* (Paris, 1868); Mosen, *Ueber Thomas Otways Leben und Werke* (Jena, 1875); Löwenberg, *Ueber Otways und Schillers "Don Carlos"* (Lippstadt, 1886).

OTZEN, ŏt'sen, JOHANNES (1839—). A German architect, born at Siesby, Schleswig. He studied architecture in Hanover, and from 1867 to 1870 was second clerk in the Board of Inspection of Public Works for the Province of Schleswig. In 1870-79 he was an architect in Berlin, in 1879 was appointed professor of mediæval art in the Polytechnic Institute there, and in 1885 director of an advanced course at the Academy. He designed numerous structures, particularly churches, in Berlin and elsewhere, including Saint John's at Altona (1873) and the Church of the Holy Cross in Berlin (1888), and published *Die Baukunst des Mittelalters* (1879-83), and other works.

OUAKARI (South American name), or **UAKARI,** wä-kä'rē. One of three species of Brazilian monkeys closely related to the sakis, distinguished by their long silky hair and stump-like tails. The best known species is the bald ouakari (*Brachyurus calva*), which is about eighteen inches in length, and has whitish fur, with the head nearly bald and the naked skin of the face brilliant scarlet. These monkeys inhabit forests of limited and local areas, often flooded for weeks at a time, and have exclusively arboreal habits, and subsist almost wholly upon fruits. Bates, in his *Naturalist on the Amazons* (London, 2d ed., 1892), gives a most interesting account of their habits and behavior in captivity. See MONKEY.

OUBLIETTE, ōō'blē-ĕt' (Fr., from *oublier*, to forget, from Lat. *oblivisci*, to forget). A deep pit or well under a dungeon, having an opening only at the top, into which prisoners were thrown to die. There are but few authenticated instances of its employment.

OUDE, oud. A province of British India. See OUDH.

OUDENARDE, or **OUDENAARDE,** ou'dē-närd' (Fr. *Audenarde*). A town in the Province of East Flanders, Belgium, on the east bank of the Scheldt, 15 miles southwest of Ghent (Map: Belgium, B 4). Its chief building is a fine Gothic council house built from 1525 to 1529. There are manufactories of linen and cotton and extensive tanneries. At Oudenarde, on July 11, 1708, the French under Vendôme were defeated by the Allies under Marlborough and Prince Eugene. Population, in 1900, 6204.

OUDH, oud, or **AJODHYA,** ȧ-jōd'yȧ. A suburb of Faizabad (q.v.), Oudh, India.

OUDH, or **OUDE,** oud (Hind. *Awadh*). A province of British India, forming a chief commissionership administratively connected with the United Provinces of Agra. It lies south of the Himalayas, one of whose minor ranges separates it from Nepal, while on the east, south, and west it is bounded by the United Provinces of Agra, the southern boundary being formed by

the Ganges (Map: India, D 3). Area, 24,217 square miles. The northern part, at the foot of the mountains, consists of dense and unhealthful forest jungle; the remainder belongs to the alluvial valley of the Ganges, several of whose large tributaries traverse the province lengthwise from northwest to southeast. Though there are hot and sultry months and a long rainy season, the climate is the most healthful in the Ganges Valley.

AGRICULTURE. Agriculture is the only extensively developed industry. The fertile plains produce abundantly when sufficiently watered. Nearly a third of the cultivated area, or 2,700,000 acres, is irrigated, the supply of water being drawn principally from wells and reservoirs. About one-fourth of the cultivated land is cropped twice during the year. Rice, wheat, millet, pulse, and other cereals constitute the greater portion of the crop acreage. Sugar cane, opium, and oil seeds cover a much less area, but are commercially important. Cattle and buffaloes are used as beasts of burden, and but few of the other domestic animals are raised.

TRANSPORTATION AND COMMERCE. A railway traverses the province from east to west. A branch line connects it with Cawnpore on the Ganges, and this point, although outside the province, is its chief collecting and distributing centre. Wheat, oil seeds, and opium are the most important exports. Some trade is maintained with the adjoining territory of Nepal on the north. Most of the manufactured products required are imported from European countries.

POPULATION. Oudh is one of the most densely populated portions of India, the number of inhabitants in 1901 having been 12,884,000, or 532 to the square mile. The Hindus outnumber the Mohammedans about 7 to 1. The Hindu and Mohammedan religions practically absorb the whole population; Christianity has not secured much hold, the census of 1901 returning 9312 Christians, of whom only 2274 were native converts. Lucknow, the capital, with a population (1901) of 263,900, is the fifth largest city of India, and the only large city in the province.

HISTORY. Oudh is believed by Sanskrit scholars to be the ancient *Kosala*, the oldest seat of civilization in India. The country was conquered by a Mohammedan army about 1195, was annexed to the realm of Delhi, and subsequently was made a province of the Mogul Empire. In the first half of the eighteenth century Oudh practically emancipated itself from the rule of the Great Mogul, and for over a century had its own dynasty. The Nawab Vizier, Sujah-ud-Dowlah, played a prominent rôle in the days of Clive and of Hastings. The misrule of the princes brought about the annexation of Oudh by the East India Company in 1856. When the mutiny of 1857 broke out, Oudh became one of the great centres of rebellion.

Consult: Butler, *Description of the Kingdom Oude* (London, 1853); Sleeman, *A Journey Through the Kingdom of Oude in 1849-50* (ib., 1858); *Gazetteer of Oude*, vols. i.-iii. (ib., 1877-78); Irwin, *The Garden of India; or Chapters on Oudh History and Affairs* (ib., 1880).

OUDINOT, ōō'dē'nō', CHARLES NICOLAS, Duke of Reggio (1767-1847). A Marshal of France. He was born at Bar-le-Duc, in the Department of Meuse, France, April 25, 1767. He entered the army at the age of seventeen, and distinguished himself in 1790 by suppressing a popular insurrection in his native district. He rose quickly, in 1794 became general of brigade, and added to his reputation in the war against Prussia and Austria. He became general of division in 1799, and received important commands from Napoleon. In 1805 he received the command of ten battalions of the reserve, afterwards known as the Oudinot Grenadiers. He was present at Austerlitz (1805) and Jena (1806), and defeated the Russians at Ostrolenka February 16, 1807. He contributed to the success of the French at Friedland, June 14th, and after the Peace of Tilsit was rewarded with the title of count and a large sum of money. At Wagram (July 6, 1809) he fully sustained his reputation as a general, and soon after was made Marshal of France and Duke of Reggio. In 1810 he was charged with the occupation of Holland. He was engaged in the disastrous Russian campaign of 1812, when he earned praise by his skillful tactics by which the crossing of the Beresina was protected. He subsequently took part in the various battles of 1813 between the French and the Allies, being defeated at Grossbeeren (August 23, 1813), and fighting valiantly at Leipzig. He was one of the last to abandon Napoleon. During the Hundred Days he remained on his estates. After the second Restoration he became a Minister of State, major-guard of the Royal and commander-in-chief of the National Guard, and a peer of France. In 1823 he commanded the First Army Corps in the invasion of Spain, and was for some time Governor of Madrid. After the Revolution of July, 1830, Oudinot retired to his estates, and only at rare intervals appeared in the Chamber of Peers. He died in Paris, September 13, 1847. His *Souvenirs* were published in 1894. His son, NICOLAS CHARLES VICTOR OUDINOT, Duke of Reggio (1791-1863), was a general in the French Army. He distinguished himself in Algeria and in the Revolution of 1848, and later became commander-in-chief of the Army of the Alps. In April, 1849, he was appointed general of the French expedition against Rome, and forced the city to surrender unconditionally on July 2. After the coup d'état, December 2, 1851, he was arrested and imprisoned. He was soon set at liberty, and spent the remainder of his life in retirement. He was the author of several books on military matters. He died July 7, 1863.

OUDRY, ōō'drē', JEAN BAPTISTE (1686-1755). A French painter, born in Paris. He studied under his father, Jacques Oudry, and under Serre and Largillière; was received at the Academy in 1719, and became a professor there in 1743. He was appointed animal painter to the King, Louis XV., and painted his favorite dogs and incidents of the chase. In 1734 Fagon put him in charge of the Beauvais factories, and afterwards he was made superintendent of the Gobelins, for which he executed many designs. Several of his works are to be found in the Louvre and in the provincial museums. He also painted historical scenes and portraits, but less successfully.

OUGHTRED, WILLIAM (1575-1660). An English divine and mathematician, born at Eton.

He entered King's College, Cambridge, in 1592, where he became a fellow in 1595. He was rector at Albury, near Guildford in Surrey (1610), and about 1628 engaged by the Earl of Arundel to tutor his son in mathematics. Oughtred was among the first to use modern symbols of operation, particularly × for multiplication and :: for equality in the algorism of proportion. Abbreviations for sine and cosine are found in his work on trigonometry. His principal mathematical works are: *Clavis Mathematicæ* (1631); *Trigonometria* (1657); *Solution of All Spherical Triangles* (1657); *Canones Sinuum, Tangentium, Secantium et Logarithmorum*, etc. (1657); *Opuscula Mathematica Hactenus inedita* (1677).

OUGREE, o͞o'grā'. A town of Belgium, in the Province of Liège, situated three miles south of Liège. It is an important industrial centre with coal mines, blast furnaces, rolling mills, and machine shops. Population, in 1900, 12,835.

OUIATCHOUAN, wē-ä'chwän. An affluent of Lake Saint John Canada.

OUIDA, o͞o-ē'dä. *Fr. pron.* o͞o'ē'dä'. An English authoress. See RAMÉE, LOUISE DE LA.

OULESS, o͞o'lĕs, WALTER WILLIAM (1848—). An English portrait painter, born at Saint Hélier, Jersey. He studied at the Royal Academy, began to exhibit there in 1873, and was elected a member in 1881. His work includes the portraits of many of his notable contemporaries, and he is ranked among the first of the English portrait painters.

OUNCE (Fr. *once*, Sp. *onza*, It. *onza*, *lonza*; perhaps, by loss of initial *l*, supposed to represent the definite article, from Lat. *lynx*, Gk. λύγξ, lynx; according to others the *l* is ultimately connected with Pers. *yōz*, panther). A large cat (*Felis uncia*), which resembles the leopard, but has much rougher and longer hair, and a longer and much more bushy tail; the general color is also paler, the rosette-like spots are less sharply defined, and there is a black spot behind the ears. Its range is very extensive, for it is found in Persia, Northern India, Tibet, China, Siberia, and even Saghalien. It frequents rocky ground, and is adapted to cold climates, so that in the warmer countries of its range it is found at considerable elevation. It feeds chiefly on goats, sheep, and other quadrupeds, but rarely attacks man. See Plate of WILD CATS, under CAT.

In South America 'ounce' and its equivalents usually refer to the jaguar (q.v.).

OUNCE. See WEIGHTS AND MEASURES.

OUR AMERICAN COUSIN. A comedy by Tom Taylor, produced in 1858. The leading characters are Lord Dundreary, created by Sothern, and Asa Trenchard, the Yankee, by Joseph Jefferson. At a performance of this play at Ford's Theatre, Washington, Lincoln was assasinated.

OURAY, o͞o'rā (1820-80). An Indian chief, born in Colorado, where his people, the Uncompahgre Utes, bore in their special tribal title, which is probably a corruption of 'un compadre,' the evidence of their friendship to the whites. Ouray himself was engaged in a fierce struggle with the Sioux in his early manhood, and his only son was captured by his enemies, never to be restored; but he was always the 'white man's friend,' spoke and wrote Spanish, and adopted civilized habits, living for many years on a farm which he cultivated himself. His influence with his people was firm, and the tribe never broke a treaty. Even in 1879 he was successful in his attempts to restrain them from rising at the time of Meeker's murder. Ouray visited Washington several times, and brought about the sale of the Ute reservation in Colorado.

OURIQUE, o͞o-rē'kĕ. A small town in Southern Portugal, noted for the great victory over the Moors won by Alfonso I. in 1139. This victory secured for him the kingship of Portugal. It afterwards became famous in legend. The Christian forces were said to have been 13,000, the Moorish 400,000. Christ was said to have appeared to Alfonso, promising victory and the royal title.

OUR MUTUAL FRIEND. A novel by Charles Dickens (1865). It contains two stories. The principal plot concerns John Harmon, who, under the disguise of Rokesmith, keeps watch of his large fortune and marries Bella Wilfer. The other story centres around Lizzie Hexam, the bargeman's daughter, and her lover, Eugene Wrayburn. Mr. Boffin, the 'Golden Dustman,' and his wife connect the two stories. The minor characters are Silas Wegg, Jenny Wren, and old Betty Higden.

OURO PRETO, o͞o'rō prā'tō (Port., black gold, from the color of the argentiferous rocks in the neighborhood). A city and formerly the capital of the State of Minas Geraes, Brazil, situated on the western slope of the Serra do Espinhaço, 170 miles north of Rio de Janeiro (Map: Brazil, J 8). It is a very picturesque town, with quaint buildings; but, being founded as a mining town, its location was selected only with a view to easy accessibility to the mines. It is built on the side of a very steep hill, and is shut in by a mountain on one side and a narrow gorge on the other, so that it has no room for expansion. For this reason the State Government was removed in 1894 to Bello Horizonte or Minas (q.v.). Its gold mines, which formerly yielded rich returns, are now almost abandoned, and the town has greatly declined. Previous to 1894 its population was 26,000; in 1899 it was only 14,000.

OUSE, o͞oz. The chief river of Yorkshire, England (Map: England, F 3). It rises by two headstreams in the Pennine Hills on the border of Westmoreland, and flows southeastward until it joins the Trent to form the Humber (q.v.). Its total length is 130 miles, and it is navigable for large vessels 45 miles to York.

OUSE, GREAT. A river of England, rising in Bedfordshire, and flowing northeast into the Wash at King's Lynn (Map: England, G 4). It is 160 miles in length, and navigable for about 50 miles.

OUSELEY, o͞oz'lĭ, FREDERICK ARTHUR GORE (1825-89). An English Church composer and musical theorist, born in London. After his graduation from Oxford, he entered holy orders and became a curate in London; after which he was appointed precentor of Hereford Cathedral in 1855, and incumbent of Saint Michael's, Tenbury, in 1856. He was one of the founders, and later warden, of Saint Michael's College, Tenbury, an institution for the instruction of boys

in classics and choral singing, and bequeathed to it his valuable music library. He took the degree of doctor of music at Oxford in 1854, and the next year became professor of music there. He published a number of musical collections, a *Treatise on Harmony* (1868), and *A Treatise on Counterpoint, Canon, and Fugue* (1869). He was also the author of the oratorios *The Martyrdom of Saint Polycarp* (1855) and *Hagar* (1873); considerable salon music; a number of anthems; and edited, with Dr. Monk, *Anglican Psalter Chants* (1872). He died at Hereford.

OUSELEY, GIDEON (1762-1839). The Wesleyan apostle of Ireland. He was born at Dunmore, Ireland, February 24, 1762, of a family distinguished in English history. In his youth he was reckless, but in 1791 became religious under the influence of Wesleyan soldiers stationed at his native place. He soon became an evangelist, preaching with fervor and boldness in the streets and churchyards, fairs and markets, and at the wake-houses. Without dismounting from his horse he preached from three to five times a day. After preaching thus for seven years, he was received into the Wesleyan Conference, and in 1799 appointed a missionary to Ireland. He was often roughly treated by the Irish, but being a master of the language, and thoroughly acquainted with the Irish character, he succeeded in converting thousands. At the age of seventy-four, after fifty years of devoted labor, he was still as active as ever on the highways and in the market-places, preaching fourteen, sixteen and sometimes twenty sermons a week. He was the author of several polemical publications, of which the most important is *A Short Defense of the Old Religion* (1812; reprinted as *Old Christianity Against Papal Novelties*, 5th ed. 1827). He died in Dublin, May 13, 1839. Consult his *Life* by Arthur (London, 1876).

OUSELEY, Sir WILLIAM (1767-1842). A British Orientalist. He was born of Irish parentage at Monmouthshire, England. He went to Paris in 1787, and there commenced his Oriental studies. In 1788 he entered the army as cornet of dragoons, and, after seeing active service under the Duke of York, in 1794 left the army to continue the study of Persian and other Oriental literature at the University of Leyden. The fruits of his studies were embodied in four works published between 1795 and 1804, the earliest of which gained for him in 1797 the honorary degree of LL.D. from Trinity College, Dublin, and of Ph.D. from the University of Rostock. In 1800 he received the honor of knighthood from the Viceroy of Ireland. He perfected his colloquial knowledge of Persian by several months of residence in the London household of the Persian Ambassador, Mirza Abul Hassan, and as private secretary to his brother, Sir Gore Ouseley, who had been appointed British Ambassador to Persia, went to that country in 1810, where he remained until 1813. He was elected member of several learned societies, and was a prolific contributor to the *Translations* of the Royal Society of Literature. He died at Boulogne. His principal works are: *Persian Miscellanies* (1795); *Oriental Collections* (1797-79); *Tales of the Bakhityar Nama and the Ten Virgins* (1801; new ed. 1883); and *Travels in Various Countries of the East, More Particularly Persia in 1810, 1811, 1812* (1819-23).

OUSTER (OF. *ouster, oster*, Fr. *ôter*, to remove, oust, from Lat. *haurire*, to draw). The deprivation or exclusion of the rightful owner from the possession or enjoyment of land. Such dispossession may be effected by an entry on the lands under a claim of title, or by a person remaining on lands after his title or right to possession of them has ceased, to the exclusion of the owner, or one next entitled to possession. The exclusion from possession or enjoyment of land of one tenant in common by a co-tenant would constitute an ouster. An ouster is distinguished from a trespass, which is a temporary encroachment on, or invasion of, the real estate of another, usually without a claim of right. The remedy for an ouster is an action to recover possession of the property. See DISSEISIN; EJECTMENT; TRESPASS.

OUTAGAMIES, o͞o'tȧ-gȧm'iz. The name given by the Ojibwas to the Fox Indians.

OUTCROP. A term applied in geology to the edges of strata which appear at the surface. The outcrop of a mineral vein is sometimes called the apex.

OUTLAWRY. An ancient common-law process for compelling the appearance of a person before a court of justice. Its origin dates back to the reign of King Alfred, and it was probably devised as the most efficient means of securing the punishment of a culprit. The courts and officers of the peace were not well organized at that time, and it was not difficult for a criminal to elude the King's officers. However, a decree of outlawry against an alleged criminal bound every honest person to attempt to capture him if he crossed his path. The outlaw was deprived of all rights as a citizen, or even as a human being. He was considered as a wild beast, the decree at a later date bearing the words, *Caput gerat lupinum* (Let him bear the wolf's head), which signified that it was the right, and even the duty, of any person to knock him on the head as if he were a wolf. To harbor or render assistance to an outlaw was a capital crime, punishable with death. Outlawry was, therefore, equivalent to a sentence of death, and, in addition, the outlaw was deprived of all property rights, his land escheated to the King, or under the feudal system to his lord, his chattels being always forfeited to the King. The law in this respect continued the same until the thirteenth century, when the reform of prohibiting the public from wantonly killing an alleged outlaw, unless in an attempt to capture him, was introduced. Even at that time, if on the trial the mere fact of outlawry was established, the sentence was death. However, toward the end of the thirteenth century, the penalty of death was no longer inflicted in cases of 'minor outlawry,' that is, where the process had issued in a civil cause, or in a prosecution for a crime less than felony or treason. The decree of outlawry at that time was issued in so many cases where the accused person had not intentionally disobeyed a summons from a court, or had never been informed that he was accused, that it became customary for the King, when such a case was brought to his attention, to 'inlaw' the person. This was effected by a decree removing the ban of outlawry, and the accused could then

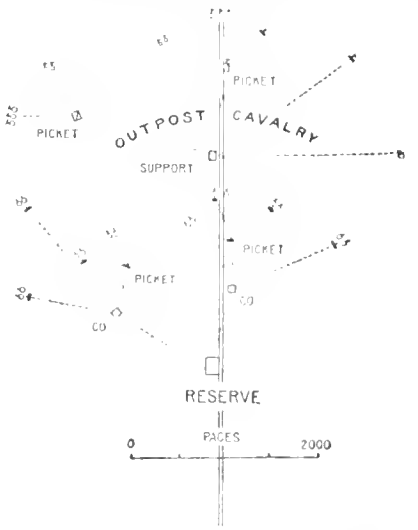
appear and stand trial for the offense originally alleged to have been committed by him. However, the person who thus again received the protection of the law was considered a new person, as if he had just been born, and was not thereby restored to his former property rights.

The outlaw's blood was said to be 'corrupt,' and a child born to him after the decree was incapable of inheriting, not only from the father, but from any one else. By the statute, 5 and 6 Edw. VI., c. 11, a person outlawed for treason while abroad was permitted to return to the country within a year and a day and stand trial, but no provision of this sort in regard to felony has ever been made. The 'Forfeitures Act,' 1870, 33 and 34 Vict., c. 23, reserved forfeitures of lands and chattels to the Crown in cases of outlawry for treason and felony. Outlawry for misdemeanors may still be imposed, but such a judgment amounts only to a conviction for contempt of court, although it entails a forfeiture of chattels to the Crown. The sovereign alone can pardon an outlaw. The process of outlawry has not been used in England since 1859, but the above statutes still remain in force.

The process of outlawry is entirely obsolete in the United States, and it is doubtful if it has ever been employed since the War of the Revolution. The term outlaw has been loosely applied in some criminal statutes to designate bandits or wandering marauders, who habitually live by crime, but it has not the signification it bears under the laws of England. See CRIME: FELONY. Consult Legge, *The Law of Outlawry* (London, 1779); Blackstone, *Commentaries*.

OUTPOSTS. The security of troops *at a halt*, that is, in camp, bivouac, or cantonment, is insured by means of outposts, or detachments thrown out from the main body to protect it from surprise. These are either separate detachments, at important points, or a continuous chain. The latter is rarely necessary in war, because the armies are seldom in such close contact as to require it. For a few days before and after a decisive engagement it may be necessary, but during the course of the operations between battles there is no such immediate danger, especially for the infantry. The cavalry is, of course, constantly in touch with the enemy, and the best protection for it is the patrols close up to the enemy, with the main body of cavalry retired a mile or so for rest, the reconnaissance squadrons remaining assembled out in front covered by a few posts and patrols in their immediate vicinity. If the distance to the reconnaissance squadrons is very great, *outpost squadrons* are sent out to cover the intervening space, and as a rule they will be sufficient. Only occasionally, as on the night after a battle, is it necessary to add an *outpost reserve*, or main body. Each outpost squadron has a particular section of ground assigned to it, for the security of which it is responsible, and for observation *pickets* are pushed out, from which *vedettes* are sent to the front as *sentinels*. In the arrangement of pickets and vedettes, particular attention is given to gaining a good outlook over the surrounding landscape and the main roads must be observed. In general, security is better insured by constant communication between the reconnaissance detachments and behind the pickets than it can be by a continuous line of posts; these outposts require no special outpost commander, the squadrons acting independently.

If the screening cavalry in this way insures its own safety, it necessarily relieves the other troops in rear from a great part of this duty. In many cases the troops in rear can entirely dispense with outposts; again, when there is no chance of a battle taking place within a day or so, each subdivision may be left to look after its



THEORETICAL DISPOSITION OF OUTPOSTS.

own security. The strength and energy of the enemy is always an important factor, as well as the feeling of the inhabitants of the country, and when the enemy is very near, a connected line of outposts is demanded, composed, in general, of mixed troops. At the end of a march the advance guard, either in whole or in part, takes charge of the outpost duty. On resuming the march a new advance guard is formed, the old being relieved after the new has advanced beyond its lines. See ADVANCE GUARD.

The entire outposts in this case are under one or more outpost commanders, depending on the length of the line and the character of the ground. The main line is composed of outpost companies or supports, for which a *reserve* is provided when necessary, and this is placed either in rear or on the same line, depending on the point where support is most desired. If there is no outpost cavalry available, patrols (q.v.) must be sent out by the outpost companies, but the latter must have a few cavalrymen as messengers, or in their stead cyclists. On coming into position a picket ahead on the road is usually sufficient, but at night other pickets and sentinels may be required.

OUTRAM, ōō'trăm, Sir JAMES (1803-63). A British Indian soldier and statesman. He was born at Butterley Hall, Derbyshire, and was educated at Udny, Aberdeenshire, and afterwards at Marischal College, Aberdeen. He received his commission, and was sent to India as a cadet in 1819. He gained distinction in his conduct of the campaign of the wild Bhils of Khandesh

against the Dang tribes; the restoration of order in the Mahi Kanta; the Afghan campaign of 1839, during which he acted as aide-de-camp to Lord Keane, and in which he performed his famous perilous ride from Khelat, through the Bolan Pass. He was political agent at Gujarat, and afterwards commissioner in Sindh, and upon the annexation of Oudh was made resident and commissioner, by Lord Dalhousie. Owing to ill health, he returned to England in 1856, but with the outbreak of the Persian War he was sent with the British forces to the Persian Gulf, with diplomatic powers as a commissioner—after which he returned to India. At the commencement of the Indian Mutiny in 1857 he was commissioned to take charge of the forces marching to the relief of Lucknow, but refused to take precedence of his friend Havelock, and took up only his civil appointment as chief commissioner of Oudh, serving under Havelock as a volunteer. After the relief of Lucknow he led a skillful movement up the left bank of the river Gumti, which led to a final and complete victory over the insurgents. He was next made chief commissioner of Oudh, in 1858 was made lieutenant-general, and in 1860 received the thanks of Parliament. He took his seat as a member of the Supreme Council of India in Calcutta, but was compelled by ill health to return in 1860 to England. India founded an institution in his honor and presented him with valuable gifts, besides erecting a statue of him at Calcutta. He died at Pau, France, March 11, 1863. He is known as the 'Bayard of India,' and was conspicuous for his fair play and generous championship of the natives of India.

OUTRE-MER, o͞o'tr'mâr, A Pilgrimage Beyond the Sea. Sketches of foreign travel by H. W. Longfellow (1835).

OUVRARD, o͞o'vrär', Gabriel Julien (1770-1846). A French financier, born near Clisson, in the Department of Loire-Inférieure. During the early years of the French Revolution he amassed a large fortune, and under the Directory he became one of the principal creditors of the State. Contracts with the Spanish Government netted him immense profits and his income from other sources was enormous. Between 1802 and 1804 his loans to the Government amounted to nearly 300,000,000 francs. He subsequently furnished the means for Napoleon's great military undertakings. The enmity of the Emperor brought about the dissolution of the company of which Ouvrard was the head and the arrest of the banker, who from 1810 to 1813 remained in prison. Later in life he suffered imprisonment for illegal transactions on the Bourse, and after his release went to England, where he died. His *Mémoires* appeared in Paris in 1826.

OUZEL, o͞o'z'l, or **OUSEL** (AS. *osle*, OHG. *amsala, amusla*, Ger. *Amsel*, ouzel, of uncertain etymology). An old name of the English blackbird. It is also applied to other birds, chiefly of the thrush family. Thus, one British thrush (*Merula torquata*) is called the 'ring-ouzel.' The European dipper is very generally known as the 'water ouzel,' and in the United States the term is restricted to our dipper (q.v.) of the Rocky Mountain region.

OVALLE, ô-väl'yâ. The capital town of the province of the same name, Chile, on the right bank of the Limarí River, 170 miles north of Valparaiso, and on the railway from La Serena to San Marco (Map: Chile, C 10). It is a well-built town, in a well-irrigated valley, and was founded in 1831. Its population, in 1885, was 5426.

OVALS OF CASSINI, kâs-sē'nê. See Cassinian Oval.

OVALS OF DESCARTES, dâ-kärt'. See Cartesians.

OVAMPO, ô-väm'pô. A Bantu people living on the northern boundary of German Southwest Africa. They are divided into a number of tribal groups each ruled by an hereditary chief. They are tall, robust, well-proportioned, with regular features; they are very peaceful and kind in disposition and superior in intelligence to other South African tribes. They do not live in villages, but in family communities. The houses are very low, conical structures, designed mainly for sleeping purposes. They also have granaries and chicken houses set up on posts. They raise corn and have great herds of cattle. The men go naked; the head is shaved except a small lock. They wear sandals like the Bechuana. The women wear a waist cloth and a small apron. Their hair is impasted with grease mixed with red clay. Beads and large brass rings are worn as ornaments. To the women fall the duty of building the houses and a large part of the agricultural work. The men hunt wild animals and work in iron and copper, in which art they are very skillful. They are fond of dancing to the music of a drum and a kind of guitar. In ceremonial greeting of friends they anoint the face and breast of the visitor with butter.

Consult: Andersen, *The Okovango River* (London, 1861); Stanford, *Africa* (London, 1895).

OVANDO, ô-vän'dô, Nicolas de (c.1460-c.1518). A Spanish Governor of the West Indies, born in Valladolid. He was a commander of the religious Order of Alcántara, stood high in the favor of King Ferdinand and Queen Isabella, and in September, 1501, was appointed to succeed Francisco de Bobadilla (q.v.) as Governor of the West Indies. Leaving the port of San Lucar, February 13, 1502, with a company of 2500 persons—the largest company which had hitherto been sent to the West Indies—he arrived at Santo Domingo April 15th, and remained as Governor until replaced by Diego Columbus in 1509. He proved a successful ruler over the Spaniards, founded a number of new settlements, and did much to restrain turbulence and disorder. Toward the Indians, however, he was despotic and cruel. He prosecuted several ruthless wars against them, his soldiers putting captives to death after subjecting them to hideous tortures; and virtually enslaved many thousands of them, through the establishment of the *encomienda* system, whereby they were distributed in lots of 50 or 100 among the Spaniards.

OVAR, ô-vär'. A town of Portugal, in the Province of Beira, 20 miles south of Oporto, at the head of one of the branches of the curious lagoon or bay called Rio d'Aveiro (Map: Portugal, A 2). (See Aveiro.) It is a prosperous and increasing town and carries on an extensive fishery and a considerable trade in wine, grain, and fruit. Population, in 1900, 10,582.

O'VARIOT'OMY. See Ovary.

OVARY (from Lat. *ovum*, egg; connected with Gk. *ᾠόν*, *ōon*, OChurch Slav. *aye*, *yaye*, OHG. *ei*, Ger. *Ei*, AS. *æg*, Eng. *egg*). One of the pair of organs which in the female of any species produce the *ova*, or female reproductive bodies. They are analogous to the testes in the male. They may be described as two oval flattened bodies, an inch and a quarter to an inch and a half long, three-quarters of an inch in width, and nearly half an inch thick, in the human subject, situated on either side of the uterus, to which they are connected by ligaments and by the Fallopian tubes. On making a section of an ovary, numerous vesicles are observed in its interior. These are the ovisacs of the future *ova* or germs, and are termed the *Graafian vesicles*. Before impregnation they vary in number from 10 to 20, and in size from that of a pin-head to that of a pea; but on microscopic examination great numbers of minute undeveloped vesicles are also found to be present. At each monthly period a ripe Graafian vesicle bursts and the ovum contained in it makes its way by the ciliary motion of the epithelial lining of the tube along the Fallopian tube to the uterus, where if not impregnated it is disintegrated or passes off with the menstrual discharge.

Of the morbid conditions to which the ovary is liable by far the most important is the formation of tumors. These may be either solid tumors or cystic tumors. The cystic tumors, which consist of a sac containing a fluid or semi-fluid substance, are of much more frequent occurrence than the solid tumors. They are known as *ovarian cysts*. Two principal varieties of cysts are usually encountered, the first of which is a small cyst which has its origin from degeneration of the Graafian follicle. It usually grows to the size of a fist and but rarely attains the size of a man's head. The second variety is the large multilocular cyst made up of innumerable cysts of small size which as they grow partially fuse together and form the larger loculi or subdivisions which compose the fully developed tumor. This variety of cyst has its origin from abnormal growth and development of the glandular epithelium of the ovary. Besides these two varieties of cysts a third variety of cyst, known as the *dermoid cyst*, also occurs not infrequently. It presents when opened a characteristic pulpy substance with which are mingled hair, nails, teeth, and pieces of cartilage, bone, etc.

Of the solid tumors of the ovary carcinomata and sarcomata are the most important.

The modern treatment of ovarian tumors is by ovariotomy, a surgical operation for removal of the tumors, as soon as their existence is recognized. Tapping of ovarian cysts by puncture is now only occasionally employed, and then only as a palliative measure.

OVARY. In flowering plants (angiosperms), that usually bulbous portion of the pistil which contains the ovules. The name was given under the mistaken impression that the ovules correspond to eggs, for which reason the term ovulary has been suggested to avoid confusion with the ovary of animals, a totally different structure. See FLOWER.

OVATION. See TRIUMPH.

OVEN-BIRD. A bird that builds a domed nest somewhat like an old-fashioned outdoor oven. The name belongs primarily to certain species of South American tree-creepers of the genus Furnarius and family Dendrocolaptidæ, which are small, non-oscine, passerine birds with short wings, feeble power of flight, and plain brownish colors. These birds are numerous in Argentina, and are familiar about village gardens and farms. Both sexes take part in the construction of the nest, which is generally in an exposed situation, remarkably large and of the shape of a dome, with a small entrance on one side. It is made of clay, mixed with a little hair or grass, well plastered together, and becomes quite firm as the clay dries in the sun. Its building sometimes requires several months. Internally, it is divided into two chambers by a partition reaching nearly to the roof, the eggs (pure white) being placed in the inner chamber on a bed of soft grass and feathers. The outer chamber seems to be intended for the male. Such nests are made by *Furnarius rufus* (the hornero or 'baker') and some others, and a new one is constructed each year; but other species of the same genus nest quite differently.

In the United States the name 'oven-bird' is given to the golden-crowned 'water-thrush' (q.v.) (*Seiurus aurocapillus*), one of the larger wood warblers. It is rather more than six inches long, olive green above, white, streaked with black, beneath, and with the centre of the crown pale rufous. During the summer it is found throughout North America, except west of the Rocky Mountains, and it winters from Florida and Texas southward. The nest is rather large, roofed over, with the entrance on one side. It is composed of rootlets, grasses, leaves, etc., and is made on the ground. The eggs are four or five, white, spotted with brown. The oven-bird is remarkable for uttering a sweet chattering song in the air at twilight, after the manner of the skylark; but it is better known by its customary accelerated call. Another peculiarity of the bird is that it walks with a see-sawing motion accompanied by a rhythmical nodding of the head. Consult for the South American oven-bird, Hudson, *The Naturalist in La Plata* (London, 1892); Sclater and Hudson, *Argentine Ornithology* (London, 1888); Newton, *Dictionary of Birds* (New York, 1893-96); and for the American oven-bird, standard ornithologies and Burroughs, *Wake Robin* (Boston, 1872, and later).

O'VERBECK, JOHANNES ADOLF (1826-95). A German archæologist and art-historian; nephew of Friedrich Overbeck, the painter. He was born at Antwerp, and studied at Bonn, where he was privat docent from 1850 to 1853. From the latter year until his death he was professor of archæology and director of the archæological museum at Leipzig. His publications include: *Kunstarchæologische Vorlesungen* (1853); *Pompeji in seinen Gebäuden, Alterthümern und Kunstwerken* (1855); *Die Geschichte der griechischen Plastik* (1857-58; 4th ed. 1894); *Die antiken Schriftquellen zur Geschichte der bildenden Künste bei den Griechen* (1868); and *Griechische Kunstmythologie* (1871-89).

OVERBECK, JOHANN FRIEDRICH (1789-1869). A German historical painter, the leader of the revival of Christian art in the nineteenth century. He was born at Lübeck, July 4 1789, received a careful education, and in 1806 went to Vienna to study at the Academy. His opposition to the pseudo-classic notions then prevailing at

that institution resulted in his expulsion in 1810, in company with several like-minded fellow students. They proceeded to Rome, where they became known as the Nazarites, because of their artistic views. (See PRE-RAPHAELITES.) To Overbeck, the high priest of this creed, art was a religious question, and he held that "the true home of art is within the soul before the altar of the Church." Becoming more and more absorbed in this ecclesiastic romanticism, he embraced the Catholic faith and dedicated his life to Christian art. As his part of a commission from the Prussian Consul Bartholdi to decorate a room in his house with frescoes illustrating "The History of Joseph," Overbeck painted "Joseph Sold by His Brethren" and the "Seven Years of Famine." The entire cycle was successfully transferred to the National Gallery in Berlin in 1887. Its success brought a new commission to decorate the Villa Massimi with scenes from Dante, Ariosto, and Tasso, of which Overbeck painted "Jerusalem Delivered" (completed by his devoted disciple Führich). Of his oil paintings of this period the New Pinakothek in Munich possesses three: "Italia and Germania" (1820), "Portrait of Vittoria Caldoni" (1822), and a "Holy Family" (1825). The latter, an inspired transcript of Raphaelesque forms, is one of Overbeck's most charming compositions. More important and on a larger scale is "Christ's Entry into Jerusalem," painted intermittently from 1809 to 1824, and now in the Marienkirche at Lübeck. In this composition Flemish influence appears curiously blended with the Pre-Raphaelite, a healthy realistic element being added by the introduction of contemporary portraits of relations, fellow-artists, and friends.

Meanwhile a large school gathered around him, the influence of which extended throughout Europe. A sojourn at Perugia occasioned his finest and largest fresco, "The Vision of Saint Francis" (1830), in the Church of Santa Maria degli Angeli, near Assisi, suggestive, in its purity and rare charm, of the best Pre-Raphaelites. Among the fruits of the painter's first return to his native land in 1831 were "The Triumph of Religion in the Arts" (1831-40, Städel Institute, Frankfort), accompanied by a written explanation containing a confession of his art faith, and the "Assumption" (1846-55, Cologne Museum). The impressive "Pietà" (1846, Marienkirche, Lübeck) was the outgrowth of a father's grief over the death in 1840 of his only son, a promising lad of eighteen.

Overbeck's greatness is, however, to be sought not in his paintings, but in his drawings, the most noteworthy including "Christ Blessing Little Children," "The Preaching of Saint John," "Repose in Egypt," "The Raising of Lazarus," and especially the cycles of "The Gospels" (40 cartoons, 1843-52), "Via Crucis," or "The Stations" (14 water-color drawings, 1857), and "The Seven Sacraments" (7 cartoons, 1861). Productive to the last, he died peacefully at Rome, November 12, 1869, and was buried in the Church of San Bernardo.

Overbeck's work cannot be judged by ordinary standards. His artistic creed, that the mental conception constitutes the chief merit of an art work, that outline or form is the direct vehicle of such idea, and that color and its accessories are subordinate elements, shows conclusively that he must not be viewed as a colorist. Yet in spite of its defects his art is vital in thought, form, and composition, and his works are undeniably the most perfect artistic manifestations of the great Catholic reaction dating from the beginning of the nineteenth century. Consult the biographies by Atkinson (London, 1882) and Howitt (Freiburg, 1886); also Valentine, in Dohme, *Kunst und Künstler des 19. Jahrhunderts* (Leipzig, 1883-85); Zahn, in *Zeitschrift für bildende Kunst* (ib., 1871); Pecht, in *Allgemeine deutsche Biographie*, xxv. (ib., 1887); Portig, "Friedrich Overbeck und die religiöse Malerei der Neuzeit," in *Unsere Zeit* (ib., 1887); and Rosenberg, *Geschichte der modernen Kunst*, ii. (ib., 1889).

O'VERBURY, Sir THOMAS (1581-1613). An English author and courtier, whose mysterious death has given a peculiar interest to his history. He was the son of Sir Nicholas Overbury, and was educated at Queen's College, Oxford, from which he graduated in 1598. While on a visit to Scotland in 1601 he met Robert Carr, who became the favorite of James I. of England. Through his influence Overbury rapidly rose in power. He wrote poems, the best of which is one called "A Wife." Among his intimates were men like Ben Jonson. About 1610 Carr, who had meanwhile become Viscount Rochester, fell in love with Frances Howard, Countess of Essex. Overbury was opposed to Rochester's marrying this abandoned woman, and in consequence she intrigued, until in 1613 Overbury was arrested and placed in the Tower. In this place he was poisoned by Richard Weston, a tool of the Countess, and died September 14, 1613. Rochester married the divorced Countess in December, 1613. The murder became public in 1616, and the guilty parties were imprisoned for several years. There is an edition of Overbury's works by Rimbault (London, 1856).

OVERCOMERS. A name given to a peculiar religious society which originated in Chicago about twenty-five years ago and emigrated to Jerusalem, where they are now living. They do not use the name Overcomers themselves, but prefer to be called the 'American Colony in Jerusalem.' They reject marriage and hold communistic views about property; the Bible, they claim, has been always misunderstood, and the true interpretation of it, which they alone possess, will regenerate the world. They have made a small number of converts, chiefly from the foreign population of Western States.

OVER DARWEN. ō'vẽr där'wen. A town in England. See DARWEN.

OVERFLOW BUG. A carabid beetle (*Platynus maculicollis*) of California, which occasionally becomes so numerous as to be a nuisance, although from its carnivorous habits it is ordinarily beneficial. In 1880 they were extremely abundant throughout central and southern California, and the name overflow bug was probably given to them at that time. When crushed they gave off an offensive odor, and were called in some parts of California 'grease-bugs.'

OVERLAND ROUTE. A popular term for the shortest route from Great Britain to India. The itinerary is via Paris, Lyons, the Mount Cenis Tunnel, Modena, to Brindisi, thence by steamer to Port Said, through the Suez Canal and the Red Sea to Bombay, the time occupied being about twenty or twenty-one days.

OVERSEERS OF THE POOR. Unpaid parish officers in England, whose chief duty it is to assess the poor rates and collect them. Overseers were first authorized in 1572 (14 Eliz., ch. 5), but no specific duties were assigned. In 18 Eliz. they are called "collectors and governors of the poor." In 1597 (39 Eliz., ch. 3) it was enacted that in each parish the church warden, ex-officio, and "four other substantial householders" be appointed overseers, to assess the poor rates and oversee their distribution. In 1601 (43 Eliz., ch. 2, the foundation of the present poor law) the number was placed at from two to four, and the time of appointment, Easter. This was later changed to March 25th, or within fourteen days thereafter. The duties assigned them were: (1) to raise the necessary means for poor relief by taxation of the inhabitants; (2) to undertake the entire work of relief; and (3) to carry out all other measures necessary for executing the law.

For nearly a century after the reign of Elizabeth the overseers were the sole poor law authorities. Gradually it was found necessary to place them under the supervision of the justices, and to compel them to make public reports of their doings. By Gilbert's Act (22 George III., ch. 83) paid guardians of the poor were created to have charge of actual relief, and only the function of assessing and collecting the poor rate was left to the overseers. In 1819 the Select Vestry Act (59 George III., ch. 12) authorized parishes to control the overseers by appointing select vestries and to employ paid assistant overseers. Many parishes availed themselves of this permission. The Poor Law Amendment Act (4 and 5 William IV., ch. 76) made radical changes in the poor law and in its administration, but it continued both the overseers and the guardians, subjecting the overseers to the legal and reasonable orders of the guardians and of the justices. Overseers are appointed by the justices of the peace, and service is compulsory and unpaid. Certain persons, however, are exempt from appointment. Among them are members of Parliament, clergymen, barristers and solicitors, physicians, and officers of the army and navy. Overseers must be householders in the parish.

In discharging their function of assessment and collection of the poor rate the overseers are required each year to list the property of the parish and specify the amount due from each household. The assessment is signed by two justices of the peace and then collected. Rarely, save in emergency cases, do the overseers now have anything to do with the distribution of the money. Accounts are audited yearly by a paid official, the poor law auditor.

Miscellaneous duties have been imposed upon the overseers in recent years. They make lists of voters for members of Parliament and lists of persons qualified to serve as constables. They appoint persons to enforce the compulsory vaccination acts, to see to the burial of dead paupers and of bodies cast on the shore, and they carry out the nuisance removal act where there is no local board of health, etc. See PAUPERISM, section on *England*. Consult for detailed history of overseers of the poor, Nicholls, *History of the English Poor Law* (London, 1854; vol. iii. by Mackay, London and New York, 1899).

O'VERSKOU, THOMAS (1798-1873). A Danish dramatist, born at Copenhagen. He was an actor in his youth, and early began to write for the stage. After a failure with a comedy, he successfully produced three dramas, followed by other plays, some of which are still performed. Of these, *Oestergade og Vestergade* and *Capricciosa* are the best known. He also wrote a history of the Danish Theatre, *Den danske Skueplads i dens Historie fra dens Begyndelse til vor Tid* (1854-76).

O'VERSTONE, SAMUEL JONES LOYD, Baron (1796-1883). One of the ablest authorities on banking whom England has produced. He was educated at Eton and Cambridge. On completing his studies he entered the banking and mercantile firms of Lubbock, Forster & Co., and Lubbock & Co., of which his father was the head, and upon the retirement of his father became the head of the house, which was later merged in the London and Westminster Bank. He entered Parliament in 1816 as a member for Hythe and continued to represent this constituency till 1823. In 1833 he was defeated in his candidacy for Parliament at Manchester, and did not seek to reënter public life. During his Parliamentary career Loyd had shown himself a careful student of banking questions, and in 1833 he was examined at length before a Parliamentary committee on banks of issue. He published his testimony and followed it in 1837 with a pamphlet of *Reflections Upon the State of the Currency*. In these writings he gave forcible expression to the opinions which have been known to economists as those of the Currency School. The essence of this doctrine is that the issue of bank notes cannot be left to free competition, that it should be strictly limited to institutions offering a definite guaranty of solvency in a definite coin reserve duly provided by law and attested by publication of balance sheets. The views which he expressed were not popular, but they won many adherents and eventually found expression in the Bank Act of 1844. In 1848 and in 1857, after the suspensions of the Bank Act, he was called upon to defend the act before Parliamentary committees. In 1850 he was raised to the peerage under the title of Baron Overstone and Frothingay.

OVERT ACT (OF., open). In criminal law, an open or positive act in furtherance of an intention to commit a crime, which will apparently result in the crime, unless prevented or interrupted by circumstances not foreseen by the person doing the act. A mere intention to commit crime, except in case of a conspiracy, is not a penal offense, and therefore it is always necessary to show some overt act in order to sustain a criminal prosecution. An overt act is to be distinguished from a mere preparation to commit a crime, which in the absence of statute is not a criminal offense. For example, the purchase of a gun with intention of killing another is an act of such an uncertain nature that it cannot be said that it would directly result in murder if not prevented or circumvented in some way, and would not be considered an overt act. But pointing a loaded gun at another and pulling the trigger would be an unmistakable attempt to kill, even if the powder failed to explode, as the design would be effected but for an accident. In order to maintain a prosecution for treason in England some overt act must be shown, a treasonable intention not being sufficient to constitute the offense. In order to convict one so accused it is

necessary to prove the act by at least two witnesses. See CRIME; TREASON. Consult the authorities referred to under CRIMINAL LAW; CONSPIRACY.

OVERTONE. See HARMONICS.

OVERTURE (OF. *overture*, Fr. *ouverture*, opening, from OF. *overt*, Fr. *ouvert*, open, from OF. *ovrir*, Fr. *ouvrir*, to open, from OF. *aovrir*, *aüvrir*, to open, from Lat. *ad*, to + *deoperire*, to open, from *de*, off + *operire*, to cover, from *ob*, before + **verire*, to open; connected with Lith. *vert*, OChurch Slav. *vrĕti*, Skt. *var*, to open, Oscan *vēru*, gate; the OF. *ovrir* may, however, be a variant of *avrir*, to open, from Lat. *aperire*, to open). In a general sense, an introduction, especially to an opera. The first operas had no overtures. They either began directly with the action or were preceded by a prologue which was sung. With the development of instruments it became customary to open an operatic performance with an instrumental prelude. These introductions, however, were nothing more than arrangements of popular madrigals for instruments. The oldest form of the overture originated in France, and here we can distinctly see the influence of the vocal style. Lully (1633-87) established this. Alessandro Scarlatti (1659-1725) began with an *Allegro*, which was followed by a *Grave* and ended with another *Allegro* or *Presto*. This form is known as the *Italian overture*. At that time, however, it was simply designated as *Sinfonia*. Such *Sinfonie* were soon used for concert performances, and composers began to write instrumental *Sinfonie*. It was but a step to the separation of the three parts into as many distinct *movements*. Hence the modern *Symphony* (q.v.). The modern overture may be divided into three distinct classes. (1) The *concert overture*, a work in sonata-form. But there is *no* repetition of the first, or exposition section. To this class belong the overtures of Beethoven, such as *Egmont*, *Coriolanus*. (2) The *opera overture*, consisting of a combination of various (generally the most melodious) themes from the opera. This was chiefly cultivated by Rossini, but with a more serious and artistic purpose by Weber. (3) An overture built upon themes from the opera, but with the definite purpose of giving a résumé of the action. The most famous example of this kind of overture is that to *Tannhäuser*, in which Wagner makes use of two principal themes, the chorus of the elder Pilgrims and the Venus-music. In this third class of overtures we may also place the preludes of Wagner's later dramas, which they lead directly, without a close, into the first act. See LEITMOTIV; PRELUDE.

OVERWEG, ō'vĕr-vāk, ADOLF (1822-52). A German explorer. He was born in Hamburg, and studied geology at the universities of Bonn and Berlin. In 1850 he joined Barth and Richardson in their explorations of Central Africa. He reached Lake Chad with a boat which had been brought overland from Tripoli, and devoted five weeks to exploring that lake, being the first European who had ever sailed upon its waters. He then tried to penetrate the country of Yakoba, northwest of the Benue, but his health was shattered and he returned to Kuka, near which place he died. His reports appeared in *Monatsberichte der Gesellschaft für Erdkunde* (1851-52), and in *Zeitschrift für Allgemeine Erdkunde* (1853).

OVID (PUBLIUS OVIDIUS NASO) (B.C. 43-A.D. 18). A Roman poet. He was a descendant of an old equestrian family, and was born on March 20, B.C. 43, at Sulmo (now Sulmona), in the country of the Pæligni. He was educated for the bar, and under his masters, Arellius Fuscus and Porcius Latro, he became highly proficient in the art of declamation. His genius, however, was essentially that of the poet, and the writing of verses began to absorb the time he was supposed to spend in the study of jurisprudence. By the death of his elder brother, Ovid inherited all his father's property, and went, for the completion of his education, to Athens. He afterwards made a tour of Asia and Sicily with the poet Macer. It is uncertain whether, on his return to Rome, he ever practiced as advocate. Although by birth entitled to aspire to the dignity, he never entered the Senate; his weakness of body and indolence of habit prevented him from ever rising higher than the position of a decemvir, who convoked and presided over the court of the centumviri. While his public life was unimportant, his private life was that of a gay and licentious man of letters. The restraint of marriage was always distasteful to him; twice married in early life, he soon divorced each of his wives; while he carried on an intrigue with a lady whom he celebrated as Corinna, and who has been thought to have been no other than Julia, the accomplished daughter of Augustus. Before his thirtieth year, he married a third time, and became the father of Perilla, of whom he was tenderly fond. Up to his fiftieth year he resided chiefly at Rome, in a house near the Capitol, and occasionally visited his Pælignan estate. His society was much courted, and his large circle of distinguished friends included Augustus and the Imperial family. By an edict of the Emperor, however, he was, in A.D. 8, commanded to leave Rome for Tomi, a town near the delta of the Danube, and on the very boundary of the Empire. The sentence did not condemn him to an *exsilium*, but to a *relegatio*—or, in other words, he did not lose his citizenship, and he was not cut off from all hope of a return. The cause of this sudden banishment is a mystery, since the reason assigned in the edict—the publication of his *Ars Amatoria*—was a mere pretext, the poem having been in circulation for ten years before. His cognizance of a love affair of Julia's daughter, and the consequent displeasure of Augustus or of Livia, have been adduced with various degrees of plausibility as the cause of a sentence to which Ovid himself only mysteriously refers. The misery of his life on the inhospitable and barbarous shore of the Euxine is commemorated by the poems in the composition of which he found his solace. He became a favorite with the people of Tomi, before whom he publicly recited some poems in honor of Augustus. But his devotion to the Emperor, and the entreaties addressed to the Imperial Court by himself and his friends, failed to shorten the term or to change the scene of his banishment, and he died, an honored citizen of Tomi, A.D. 18, in his sixtieth year. His works which have come down to us, either in whole or in part, appeared in the following order: (1) *Amorum Libri III.*, a revised and abridged edition of an early series. (2) Twenty-one *Epistolæ Heroidum*. (3) The *Ars Amatoria*. (4) *Remedia Amoris*. (5) *Nux*,

the remonstrance of a nut-tree against the ill-treatment it received from the wayfarer, and even from its owner. (6) *Metamorphoseon Libri XV.* This is deservedly Ovid's best known work. It seems to have been written between the poet's fortieth and fiftieth years, and treats of all the transformations recorded in legend from the creation down to the time of Julius Cæsar, whose change into a star forms the last of the series. (7) *Fastorum Libri XII.*, the first six of which are all that remain. The poem is a Roman calendar versified, and describes the appropriate festivals and mythic legends from materials supplied by the old annalists. (8) *Tristium Libri V.*, written during the first four years of the poet's banishment. They are mainly descriptive of his miserable fate, and are full of appeals to the clemency of Augustus. (9) *Epistolarum ex Ponto Libri IV.*, similar in substance to the *Tristia*. (10) *Ibis*, a short satire against some traducer of Ovid. (11) *Consolatio ad Liviam Augustam*, held spurious by some critics. (12) *Medicaminia Faciei* and *Halieuticon*, dubiously genuine, of which we possess but fragments. Several of his works are entirely lost, the one best known to antiquity being *Medea*, a tragedy.

The poetical genius of Ovid has always been admired. A masterly facility of composition, a fancy vigorous and rarely at fault, a fine eye for color, and a versification very musical in its flow, are the merits which have made him a favorite, in spite of his occasional slovenliness and falsity of thought. The best early edition of Ovid's entire works is Burmann's (Amsterdam, 1728). Of modern editions, the best is that of Merkel revised by Ehwald (Leipzig, 1889-94). The editions of single poems, especially the *Metamorphoses*, are very numerous. An important edition of the *Heroides*, with ample commentary and Greek translation by Planudes, by Palmer, should be mentioned (Oxford, 1898). Ovid has been a favorite with English translators; the *Amores* were done into English verse by Christopher Marlowe; the *Ars Amatoria* by Congreve and Dryden; the *Tristia* by Arden (New York, 1821); and many translations of the *Metamorphoses* were collected by Garth (1st ed., London, 1810, frequently reprinted).

OVIDIO, ō-vē'dē-ō, Francesco d'. See d' Ovidio.

OVIDUCTS. See Fallopian Tubes.

OVIEDO, ō'vē-ā'dō. The capital of the Province of Oviedo (the ancient Asturias, q.v.), in Northern Spain (Map: Spain, C 1). It is situated on the railroad between Leon and Gijon, 16 miles southwest of the latter. The town has been much modernized, fine wide streets have been laid out, and in the new suburb to the north of the old town there are parks, gardens, and promenades, and many attractive buildings. The principal building and the pride of the Oviedans is the cathedral, the beautiful Gothic tower of which dominates the whole city. The educational institutions include the university, with faculties of law, philosophy, and science. In 1900 there were 234 students in attendance. It occupies a square, one-story building, and has a well-equipped meteorological observatory and a museum of natural history. Besides the university there are a provincial institute, a seminary, a school of arts, a normal school, a provincial archæological museum, and a public library of 40,000 volumes. The industries are represented by a large number of tanneries, and manufactures of cloth, chocolate, flour, and bricks. There are large national establishments for the manufacture of firearms, as well as gunpowder factories and cannon foundries. Population, in 1887, 42,716; in 1900, 48,374.

OVIEDO Y VALDÉS, ō vāl-dās', Gonzalo Fernandez de (1478-1557). A Spanish chronicler, born in Madrid. He was sent by Ferdinand to Santo Domingo, in the West Indies, in 1514, as intendant and inspector-general of the trade of the New World. During his long residence in Santo Domingo he spent his leisure in acquiring an extensive knowledge of the West Indies. After his return to Spain he published at Toledo, in 1528, a *Sumario de la historia general y natural de las Indias Occidentales*, and dedicated it to Charles V. He afterwards made some additions to the work, which was republished at Seville in 1535, in twenty-one volumes, under the title *La historia general y natural de las Indias Occidentales*. He left some other books in manuscript, including incomplete manuscripts of Chronicles of Ferdinand and Isabella and of Charles V. An edition of the *Historia general* was published by the Academy, under the editorship of Amador de los Rios (1851-55). Oviedo died in Valladolid. Besides his *History of the West Indies*, we mention *Las quinquagenas*, a valuable gossiping and anecdotical account of all the principal personages of Spain in his time. This still remains in manuscript in the royal library at Madrid. A *Life of Cardinal Ximenes* is also attributed to him.

OVIPAROUS ANIMALS (Lat. *oviparus*, producing eggs, from *ovum*, egg + *parere*, to bring forth). Animals that deposit their eggs either before or immediately after fertilization, so that development of the embryo takes place outside of the body. The term was formerly used in contrast with 'viviparous,' or bearing the young 'alive.' This distinction is no longer maintained, partly because the egg is also alive, and partly because there are all possible gradations between oviparity and viviparity, even inside of the group of mammals; for the lowest mammals (duckbill and echidna) lay slightly developed eggs provided with a tough membrane or 'egg shell.' Thus arose the term 'ovoviviparous,' applied to animals of which the egg is hatched within the body of the mother, so that the young is excluded alive, although the fœtus has been inclosed in an egg almost to the time of parturition. Some fishes are 'ovoviviparous,' and so are some reptiles. These distinctions are much less important than was formerly supposed.

OVIS, OVINÆ. See Sheep.

OVISACS. See Ovary.

O'VOLO (It., from ML. *ovolum*, diminutive of Lat. *ovum*, egg). A convex molding much used in classic architecture and in succeeding styles. (See Molding.) In Roman architecture, the ovolo is an exact quarter of a circle; in Greek architecture, the curve is sharper at the top and quirked.

OVULATION. See Ovary.

OVULE (Fr. *ovule*, from ML. *ovulum*, little egg). The structure which in seed-plants (spermatophytes) becomes a seed. The name refers to the old mistaken belief that the ovule of a

plant represents the egg of an animal, and that it is fertilized and so produces a new plant. The name has been so long in use that it is still retained, although its real meaning makes it very inappropriate. Really it is a spore-case (sporangium, q.v.), and is entirely sexless. In gymnosperms (pines and their allies) the ovules are freely exposed, while in angiosperms (flowering plants) they are inclosed in the bulbous part (ovary) of the pistil, but in both cases their structure is the same. The central body of an ovule (Fig. 1) is the *nucellus*, and enwrapping it there are one or two coats called the *integuments*. At the apex of the nucellus the integuments leave a small passageway (*micropyle*, 'little gate') for the entrance of the pollen-tube (see FERTILIZATION); and near the base of the ovule they become indistinguishable from the nucellus, this region of blending being called the *chalaza*. Frequently the ovule has a slender stalk, called the *funiculus*. Within the nucellus a single large spore (*megaspore*, q.v.) is formed, which still bears its old name *embryo-sac*. This spore is peculiar in not being shed from its sporangium (ovule), and this fact results in making a seed out of the ovule. It is the business of this spore to germinate and produce a female plant (gametophyte), that is, a plant which produces eggs. This female plant thus imprisoned within the seed was long ago named the *endosperm* (Fig. 2). See SEED.

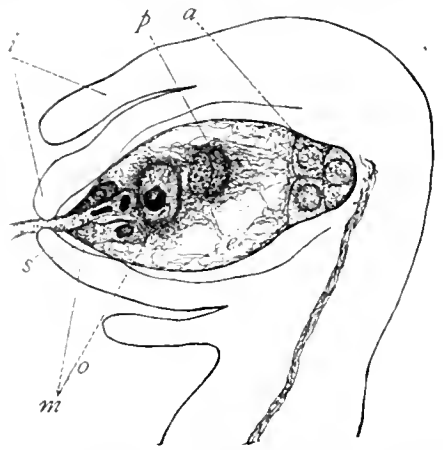


FIG. 1 OVULE.
Showing integuments (*i*), embryo-sac (*e*), antipodal cells (*a*), polar nuclei fusing (*p*), synergids (*s*), egg (*o*), and pollen tube (*m*) containing male cells.

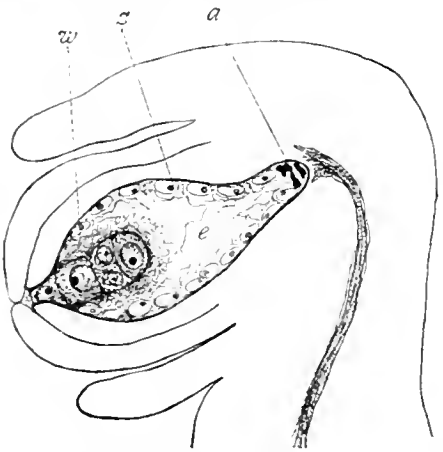


FIG. 2. AN OLDER OVULE.
Showing embryo-sac (*e*), antipodal cells degenerating (*a*), the developing endosperm (*z*), and young embryo (*w*).

In the true flowering plants (angiosperms) the ovules are exceedingly variable as to number and position within the ovary, which may contain one or a very large number of ovules, and these may be attached to the wall of the ovary, in which case they usually occur in definite lines; or they may be found attached to a central axis which projects more or less into the ovary cavity. Three well-marked forms of ovules have been distinguished, and they are usually characteristic of great groups of plants. The most common form is the *anatropous* (inverted) ovule, in which the ovule has completely turned over and its funiculus (stalk) appears as a ridge along one side of it, the micropyle (apex of ovule) thus being directed toward the base of the funiculus. Another form is the *campylotropous* ovule, in which the body of the ovule itself has become curved, the micropyle thus being directed downward. The third form is the *orthotropous* ovule, in which there is no inversion or curving, but the axis of the ovule continues that of the funiculus, and the micropyle is directed upward.

OVUM, FERTILIZATION OF. See EMBRYOLOGY.

OWARI, ō-wä'rē, or **BISHIU,** bē'shōō'. A populous and wealthy province of Japan, in the island of Hondo, one of the group known as the Tokaido or 'East Sea Circuit.' It lies south of Mino, west of Mikawa, east of Omi and Isé, and is bounded on the south by Owari Bay, into which the Kisogawa, which flows through the province, empties its waters. It has a fertile soil and is noted for its rich beds of clay, which are much used in the ceramic industries for which the province is noted. Near Nagoya (q.v.), the chief town, lies the village of Seto, where in 1297 the ceramic art of Japan had its origin, having been introduced by a native of the village, one Kato Shirozayemon (or briefly Toshiro), who had studied in China. From this circumstance *Setomono*, or 'Seto articles,' has become a synonym for all kinds of Japanese ceramic ware, just as 'chinaware' is synonymous with 'porcelain' wherever produced. Large quantities of blue ware are still produced at Seto. The province is also noted for its shippo or cloisonné enamels. Owari is included in the Ken or Prefecture of Aichi.

O'WATON'NA. A city and the county-seat of Steele County, Minn., 68 miles south of Saint Paul; on the Straight River, and on the Chicago, Milwaukee, and Saint Paul, the Chicago and Northwestern, and the Burlington, Cedar Rapids and Northern railroads (Map: Minnesota, E 6). It has Pillsbury Academy, Sacred Heart Academy, and the State Public School for Dependent and Neglected Children. Other fine structures are the court house, public library with 6300 volumes, the public schools, the opera house, and the city hospital. There are four steel bridges, and three parks: Central, Mineral Spring, and Dartt's. A productive farming district is tributary to Owatonna, and the city has also

noteworthy industrial interests, its plants including flouring mills, foundries and machine shops, a butter-tub factory, soap works, nurseries, and establishments manufacturing churns, gasoline engines, seeders, fanning mills, wagons, sleighs, automobiles, etc. Settled in 1855 and incorporated ten years later, Owatonna is governed, under a charter of 1875, by a mayor, elected annually, and a council. There are municipal water-works. Population, in 1890, 3849; in 1900, 5561.

OWE'GO. A village and the county-seat of Tioga County, N. Y., 21 miles west of Binghamton, at the confluence of the Susquehanna River and Owego Creek, and on the Erie, the Lackawanna, and the Lehigh Valley railroads (Map: New York, D 3). It is a summer resort and an attractive residential place, the home of several well-known men. It has a handsome court house, and the Coburn Free Library, containing over 8000 volumes. Considerable trade is carried on in farm produce and lumber. There are creameries, and manufactories of wagons, steel bridges, flour, silk and leather gloves, shirts, harness, and mica chimneys. The village, first incorporated in 1827, is governed under a charter of 1851, as amended in 1891, which provides for an annually elected president and council. Owego, meaning 'the place where the valley widens,' occupies the site of a small Indian village which was destroyed by General Clinton in 1779. In 1786 the first white settler came. Population, in 1900, 5039.

OWEN, ō'ĕn, DAVID DALE (1807-60). The second son of Robert Owen; born in Scotland. He came to the United States in 1823, took a degree from the Ohio Medical College, and for some years studied his profession and scientific branches in Europe. In 1833 he returned to the United States and was soon appointed State geologist of Indiana. Under the direction of the Legislature he made a geological survey of the State, and in 1839 was employed by the United States Government to make a survey of the mineral lands of Iowa, and in 1848 made similar surveys in Minnesota and adjoining Territories. The results of his work were published by order of Congress. He was employed from 1852 to 1857 in surveys of the same nature in Kentucky, and in 1857 was appointed State geologist of Arkansas.

OWEN (Lat. *Audoenus*), JOHN (c.1560-1622). An English epigrammatist. He was born at Llanarmon (Carnarvonshire), was educated at Winchester and at New College, Oxford, where in 1584 he became fellow, and from 1591 to about 1594 was a schoolmaster at Trelleck (Monmouthshire). Appointed then to the headmastership of the free school of King Henry VIII. at Warwick, he soon became known for his felicitous Latin epigrams, the first collection of which he published in 1606 as *Joannis Audoeni Epigrammatum Libri Tres*. He found a patron in John Williams, Bishop of Lincoln and Lord Keeper of the Great Seal. His work is uneven in quality, but at its best is caustically shrewd and pointed, and exceedingly skillful in its use of Latin idiom. What is perhaps his most frequently quoted line,

Tempora mutantur, nos et mutamur in illis

(bk. viii., 58, 1), is derived from Matthias Borbonius's compilation, *Delitiæ Poetarum Germanorum* (Frankfort, 1612), where in the form 'Omnia mutantur,' etc., it is attributed to the Emperor Lothair I. The best edition of the collected epigrams is by Renouard (Paris, 1794). There are English renderings by Vicars (1619), Hayman (1628), Harflete (1658), Pecke (1659), and Harvey (1677-78).

OWEN, JOHN (1616-83). An eminent nonconformist divine. He was born at Stadhampton, Oxfordshire, in 1616, of an ancient Welsh family. In 1631 he matriculated at Queen's College, Oxford, but in 1637 he was forced to leave the university because of opposition to Laud's statutes. When the Civil War broke out he warmly espoused the cause of the Parliament. He removed to London and published his *Display of Arminianism* (1643), which proved very acceptable to the Puritan party, and secured him the living of Fordham in Essex. From here he removed to Coggeshall, a neighboring vicarage. His views of Church government underwent a change, and from a Presbyterian he became an Independent, modeled his church on congregational principles, and wrote in advocacy of the latter. He preached before Parliament on the day following the execution of the King, but discreetly avoided a vindication of the act. In 1651 the House of Commons appointed him dean of Christ Church, Oxford, and the following year he was admitted vice-chancellor of the university. He was also returned to Parliament, but was unseated because of his orders. After Cromwell's death he was ejected from his deanery; but he had powerful friends at Court, and was allowed to preach, notwithstanding the Conventicle Act and the revocation of the Declaration of Indulgence, and in 1673 became pastor of a large Independent congregation in Leadenhall Street, London. In 1663 Owen was called to the First Church of Boston, Mass., but declined the call then, and when it was renewed in 1665. In 1669 he joined several other dissenting ministers in a protest against the treatment of the Baptists in Massachusetts, and in 1672 recommended a president for Harvard College, to which he had himself been called in 1670. Among his publications may be mentioned: *A Discourse Concerning Liturgies and Their Imposition* (1662); *Exercitations on the Epistle to the Hebrews* (1668-84), usually considered Owen's greatest work; *Truth and Innocence Vindicated* (1669), a reply to Parker's *Discourse on Ecclesiastical Polity; Justification by Faith* (1677); *Christologia* (1679). His works have been edited by Russell, with *Life* by Orme (28 vols., London, 1826), and by Goold, with *Life* by Thomson (24 vols., London, 1850-53).

OWEN, Sir RICHARD (1804-92). An English comparative anatomist, born at Lancaster, England, July 20, 1804. He studied medicine in Edinburgh, London, and also under Cuvier in Paris. He became a member of the Royal College of Surgeons in 1826, and practiced his profession in London, but was soon appointed assistant curator of the Hunterian Museum, and began to devote himself to the anatomy of animals. In 1834 he was appointed to the chair of comparative anatomy at Saint Bartholomew's Hospital, and in 1836 became the first Hunterian professor of anatomy and physiology in the College of Surgeons. This position involved the delivery of twenty-four annual lectures, but gave

him time for much original research, the published results of which brought him much renown, and won him the friendship of the most distinguished of his contemporaries, from the Queen and Prince Albert down. The last forty years of his life were spent at Sheen Lodge in Richmond Park, which was given him by the Queen.

The second period of his career began in 1856, when he resigned his professorship, and took the new post of superintendent of the natural history departments of the British Museum, which had previously been under the care of literary men with no special scientific training. He soon found that definite activity in the administration of the Museum was neither expected nor desired, and accordingly devoted himself with great energy to original research, making full use of the splendid collections under his hand. Having now little opportunity for dissection he spent most of his time on osteology and especially paleontology. A large amount of highly important work was accomplished, including the arrangement and revision of Hunter's manuscripts, and his own great book on the *Anatomy and Physiology of the Vertebrates* (1866-88). Owen is justly regarded as the greatest English comparative anatomist and paleontologist, and during the greater part of his life was considered Cuvier's successor in these fields. In 1883 he left the Museum, to which he had rendered priceless services, and spent the remaining years in retirement. He was made a K.C.B. in 1884. Of the innumerable works published during a literary activity of sixty-two years, at least the following should be mentioned: *Odontography* (1840-45); *Comparative Anatomy of the Invertebrate Animals* (1843); *British Fossil Mammals and Birds* (1846); *British Fossil Reptiles* (1849-84); *Experimental Physiology* (1882). Consult his *Life* by his grandson (London, 1894), which gives a complete list of his minor writings.

OWEN, Robert (1771-1858). An English social reformer, born May 14, 1771, at Newtown, Montgomeryshire, North Wales. He was the son of poor parents, and was apprenticed at ten years of age to a draper. He developed an unusual power of organization, and at nineteen years of age became manager of a cotton mill employing 500 hands. The enterprise was successful and Owen soon organized the Chorlton Twist Company, which later bought the large cotton mills at New Lanark of David Dale, whose daughter Owen married in 1799. Owen assumed the management in 1800, and New Lanark soon achieved wide reputation both for its industrial success and the prosperity of the employees. It was visited by the most prominent men of Europe. Owen opened pleasure resorts for the employees, stopped the employment of young children, and introduced a system of education far in advance of his time; improved the houses; furnished provisions at fair prices; and established insurance funds for sickness and old age. In 1813 he published his *New Views of Society, or Essays upon the Formation of the Human Character*, in which he held that character is wholly the result of the environment. Called before a Parliamentary committee in 1817 to testify regarding the causes of poverty and the means of avoiding it, he outlined the plan of a coöperative village, in which some 1200 persons should live in one large building with public kitchens and dining rooms, each family having its own private apartments and the entire care of its children until the age of three, after which they should be brought up by the community. Work and the enjoyment of its results were to be in common. Federations of such cooperative townships were to embrace the world in one great republic. From this time it was his constant dream to found an ideal community. Disciples of Owen started a colony at Motherwell, and later at Orbiston and other places, but all failed. In 1824 Owen came to America and founded at his own expense a community in Indiana at New Harmony (q.v.). This likewise failed. In 1828 Owen went to Mexico, hoping there to carry out his schemes, but was disappointed. His connection with New Lanark ceased in the same year. In 1832 he sought to establish at London a "National Labor Equitable Exchange," but this did not prove a success. In 1835 he wrote the *New Moral World*. For the rest of his life he was an advocate of Socialism, and in his old age he became a believer in Spiritualism. He was not discouraged by his failures, but labored throughout his life to better conditions, expending his entire fortune on his social schemes. The words Socialism and Socialist were used during the discussions in connection with the association of all classes of all men founded under the auspices of Owen in 1835. Owen died in his native town, November 19, 1858. Consult his autobiography (London, 1857); Booth, *Robert Owen* (London, 1869); Sargent, *Owen and His Social Philosophy* (London, 1860); Jones, *Life of Robert Owen* (London, 1892).

OWEN, Robert Dale (1801-77). A social reformer, son of Robert Owen (q.v.); born at Glasgow, Scotland, November 9, 1801. He was educated at home and in Switzerland. He came to the United States in 1825, aided his father to found New Harmony in Indiana, went back, on the failure of that scheme, to England, but presently returned and became a citizen of the United States. From 1828 to 1832 he published with Francis Wright in New York *The Free Inquirer*, a socialistic and anti-Christian weekly. He then went to New Harmony, and in 1835 was elected to the Indiana Legislature, where he distinguished himself by securing appropriations for the public school system. He was a member of Congress in 1843-47 and took a leading part in the settlement of the Northwestern boundary, in the Oregon question, and in founding the Smithsonian Institution. Failing reëlection in 1847, he took an active part in State politics, especially in furthering the legal rights of married women to property. From 1853 to 1858 he was chargé d'affaires and Minister at Naples. During the Civil War he served in the Ordnance Commission and the Freedmen's Bureau, and published an important open letter to Lincoln on emancipation. Owen was also a zealous advocate of Spiritualism. His chief publications, besides those mentioned above, are: *Outlines of the System of Education at New Lanark* (1824); *Moral Physiology* (1831); *Discussion with Origen Bachelor on the Personality of God and the Authority of the Bible* (1832); *Footfalls on the Boundary of Another World* (1859), perhaps his best-known work; *The Wrong of Slavery* (1864); *Beyond the Breakers* (1870); *Debatable Land Between This World and the Next*

(1872); and the autobiographical *Threading My Way* (1874), which deals with the first twenty-seven years of his life. He died at his summer residence on Lake George, N. Y., June 17, 1877.

OWENS, ō'ĕnz, JOHN EDWARD (1824-86). An American comedian; born in Liverpool, England, but taken to the United States when three years old. He began his stage career in Philadelphia in 1841, and within a few years his popularity won him a fortune. His *Solon Shingle* (1864) was famous both in the United States and in England; among his other favorite characters were Dr. Pangloss and the old man in *Esmeralda*, in which he last appeared in New York. Owens died at his home near Towson, Md., December 7, 1886.

OWENSBORO, ō'ĕnz-bŭr-ō. A city and the county-seat of Daviess County, Ky., 112 miles southwest of Louisville; on the Ohio River, and on the Louisville and Nashville, the Louisville, Henderson and Saint Louis, and the Illinois Central railroads (Map: Kentucky, D 3). It is the seat of the Owensboro Female College (non-sectarian), opened in 1890, and of Saint Francis Academy. Prominent features of the city are a fine United States Government building, the high school, the county jail, and the county court-house. Owensboro is surrounded by a farming and stock-raising country, and in the vicinity are valuable forests and deposits of coal, clay, building stone, iron, zinc, and lead ores. Oil wells are in operation near the city. Owensboro has steamboat communication with important points on the river, and has developed extensive commercial interests, particularly in tobacco, being one of the largest leaf and strip tobacco markets in the United States. Its manufactures are extensive and varied. There are numerous tobacco factories, whisky and brandy distilleries, buggy, carriage, and wagon factories, a wheel factory, and a cellulose factory. The government, under a legislative charter, is vested in a mayor, who holds office for four years, and a council. Administrative officials are chosen by popular vote. The electric light plant is owned and operated by the city, and $200,000 has been appropriated for a new municipal water-works system. Population, in 1890, 9837; in 1900, 13,189.

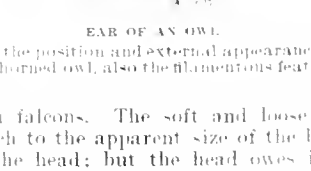
OWENS COLLEGE. A college at Manchester, England. It was founded in 1851 under the will of John Owens, a merchant of that city, who left £100,000 for the instruction of young men "in such branches of science and learning as were then and might be thereafter usually taught in English universities." Handsome new buildings have been erected, and the college has now a staff of about 50 professors and lecturers in the departments of art, science, law, and medicine. There are about 30 scholarships and prizes, and a valuable fellowship. Owens College has been constituted a college of Victoria University, chartered in 1880, a federation of colleges, having its seat in Manchester.

OWENS LAKE. A lake of California situated at the eastern base of Mount Whitney in the Sierra Nevada, 90 miles east of Tulare Lake (Map: California, E 3). It is 18 miles long and 8 miles wide, receives the Owens River (q.v.), but has no outlet. Its water is excessively saline.

OWEN SOUND. The capital of Grey County, Ontario, Canada; and a port of entry on Georgian Bay, Lake Huron, at the mouth of the Sydenham River and on the Canadian Pacific and the Grand Trunk railroads, 99 miles northwest of Toronto (Map: Ontario, C 3). It has an excellent harbor with a dry dock 300 feet long, and is surrounded on three sides by wood-crowned heights. Its public buildings include a town hall, court house, and high school. It has a trade in agricultural produce and lumber, and manufactures of mill machinery, turbine water wheels, agricultural implements, engines, sewing machines, bricks, and leather. The United States is represented by a consular agent. Population, in 1891, 7497; in 1901, 8777.

OWENS RIVER. A river of eastern California (Map: California, D 3). It rises in the Yosemite National Park, and flows southeast through an exceedingly rugged valley along the eastern base of the Sierra Nevada. It discharges into Owens Lake (q.v.) after a course of 175 miles.

OWL (AS. *ule*, *ule*, *uule*, *uula*, *huvela*, Ger. *Eule*, owl; probably onomatopoetic in origin). Any of a numerous and well-defined group of birds, the nocturnal birds of prey, constituting the Linnæan genus Strix, now the suborder Striges. Although they were formerly placed unhesitatingly in the order Raptores, of recent years there has been some tendency to separate them from the other birds of prey and place them near the nightjars, which they resemble to a remarkable degree. In appearance the owls are distinguished from all other birds by the large size of their heads and their great eyes, which are directed forward and surrounded by more or less perfect disks of feathers radiating outward and nearly hiding the small hooked bill. The claws are sharp and curved, but, like the bill, less powerful than in the Falconidæ. The outer toe is generally reversible at pleasure, so that the toes can be opposed two and two, to give greater security of grasp. The wings, although generally long, are less adapted for rapid and sustained flight than those of the diurnal birds of prey, and the bony framework by which they are supported, and the muscles which move them, are less powerful. The owls in general take their prey, not by pursuit, but by surprise, to which there is a beautiful adaptation in the softness of their plumage and their consequently noiseless flight, the feathers even of the wings being downy, and not offering as firm a resisting surface to the

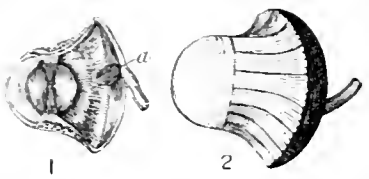


EAR OF AN OWL.

Showing the position and external appearance of the ear of a great horned owl, also the filamentous feathers about the beak.

air as in falcons. The soft and loose plumage adds much to the apparent size of the body, and also of the head; but the head owes its really large size to cavities in the skull between its outer and inner 'tables' or bony layers which cavities communicate with the ear, and are supposed to increase the sense of hearing. This sense is certainly very acute, and the ear is, in

many of the species, very large, and has a concealed yet external conch, which is found in few other birds. The feathers immediately surrounding the ear are often arranged in a kind of cone, serving a purpose like that of an ear-trumpet. Owls can see well in twilight or moonlight, but poorly in the glare of the day. The eye itself is highly perfected, and the pupil remarkably



EYE OF AN OWL.

1, Section of the eye, showing the interior parts of the globe at the insertion of the optic nerve (a) by which the vision is regulated under the great possible expansion and contraction of the eye. 2, Sclerotic coat, showing the stave-like pieces, connected by elastic tissue permitting great expansion and contraction.

contractile. The legs and feet of owls are usually feathered to the toes, and in many species even to the claws.

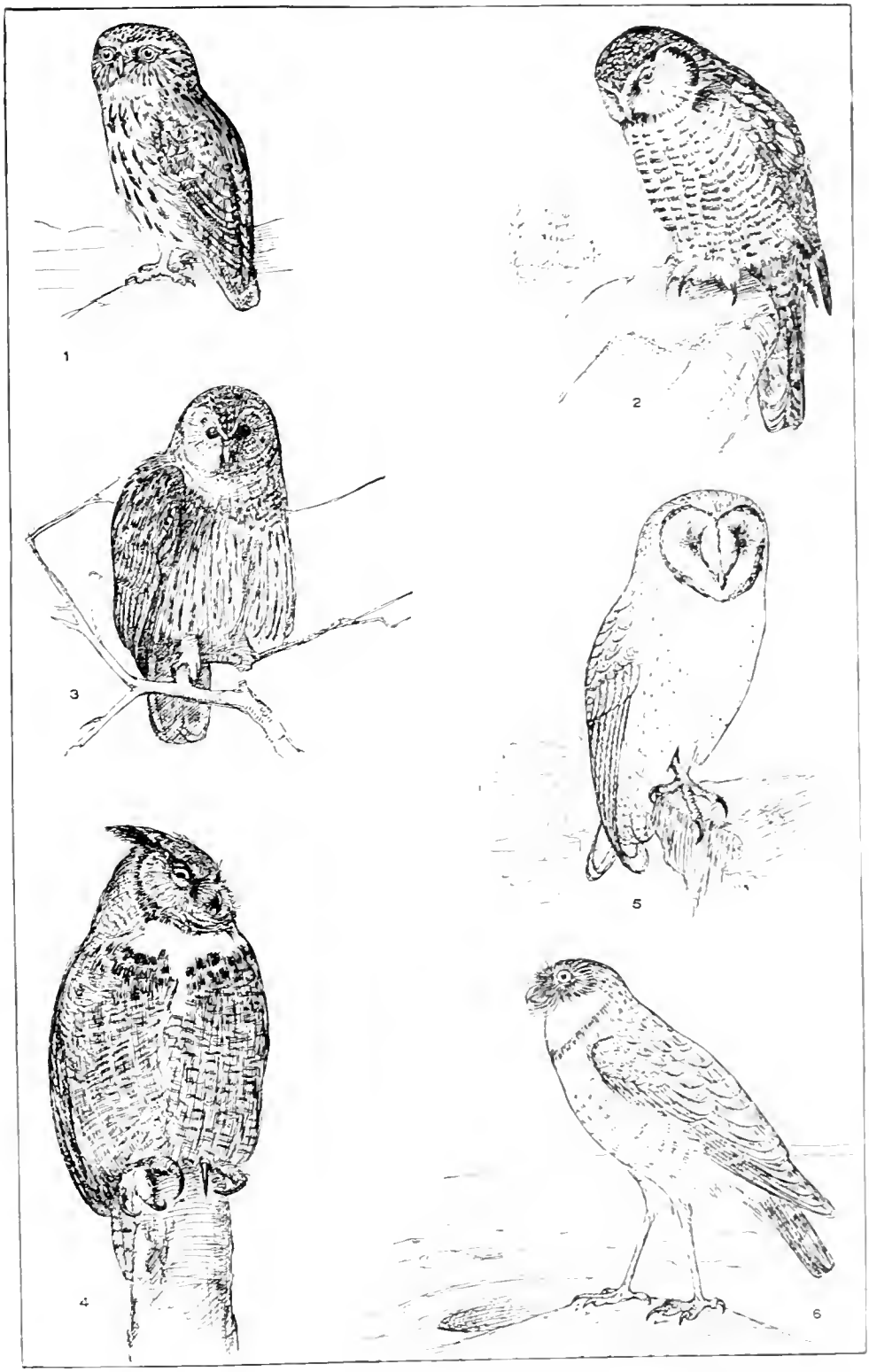
The digestive organs much resemble those of the Falconidæ, but there is no crop and the stomach is more muscular. The gullet is very wide throughout, and owls swallow their prey either entire or in very large morsels, the indigestible parts gathering into little lumps or 'pellets,' which are ejected after a time. These pellets are to be found numerously where owls roost or nestle, and their examination reveals the bird's bill of fare. The largest species feed on hares, fawns, and gallinaceous birds; others on small mammals, reptiles, birds, and large insects. Although they capture many small birds, mice form the principal element in their diet, and the owls are thus highly beneficial to agriculture, and should everywhere be protected and encouraged by farmers. Some owls also feed largely on fish (see KETUPA), crabs, and the like, which they catch for themselves.

The owl family (Strigidæ) falls into two divisions—the Strigine and the Bubonine, which are distinguished by differences in structure especially marked in the shoulder-girdle (consult Evans, *Birds*, New York, 1900). The former group is typified by the barn owl, the latter by our big barred or 'eat' owl. In size, owls vary greatly. The largest known species is the circumpolar gray owl (*Syrnium* or *Scotiaptex nebulosum*), from 27 to 28 inches long and more than 5 feet across the wings. The smallest known owl is the curious elf-owl (*Micrathene Whitneyi*) of Arizona, which is less than six inches long, and is further remarkable as having only 10 tail feathers; all other owls, so far as known, have 12. All owls have a general likeness in colors—a mixture of browns, whites, and yellows, as becomes nocturnal marauders who wish to remain unobserved, especially during the day when they are at rest. The Arctic owl becomes pure white in winter, but is brown in the summer plumage. There is little difference between the sexes, and the young, called 'owlets' or 'howlets,' resemble the adults. Owls are found in all parts of the world and in all climates, and rather more than 200 species are known. Of these 17 occur in North America, besides a dozen more or less recognizable subspecies; and about 15 species are natives of Europe. Some have a very wide geographical range, especially those of northern regions, and it is doubtful whether several species separately named in Europe and North America are really distinct, e.g. the barn-owl (q.v.). Another very widely distributed bird is the short-eared owl (*Asio accipitrinus*), which occurs in nearly all parts of the world. It is fifteen inches long, variegated tawny and dark brown, with short ear-tufts of few feathers. It is common in the United States, is somewhat migratory, and is occasionally seen in small flocks. A closely related species, rather more common generally, with long ear-tufts, is the American long-eared owl (*Asio Wilsoniana*). The hawk-owl, snowy owl, and great horned or eagle owl (qq.v.) are other handsome circumpolar species.

Other well-known American owls are the screech-owls (*Megascops asio*, with half a dozen subspecies). They are little owls, only nine to ten inches long, with ear-tufts, and are found in all parts of the United States and Canada. They are of special interest because of their remarkable dichromatism (q.v.), some of the birds having the prevailing tint gray, while others are rusty red. The barred owl, without ear-tufts, is a large species, also common throughout the United States. In the Southwestern States are found several species of little owls, which feed largely on insects, and are known as 'gnome-owls' and 'elf-owls.' They are only six or seven inches long and are not specially nocturnal. They belong to the genera Glaucidium and Micrathene. Another peculiar and interesting species is the burrowing owl (q.v.) of the Plains. It is not the only owl which inhabits holes in the ground. The boobook of Australia (*Ninox boobook*) is a species of owl, which frequently repeats during the night the cry represented by its name, as if it were a nocturnal cuckoo, as the inhabitants generally believe.

Of British species, one of the most common and familiar, and the one most often referred to in literature, is the 'tawny,' 'brown,' or 'ivy' owl (*Syrnium aluco*), which is of medium size, and mottled ash-gray and brown, with the under parts lighter. It inhabits church belfries, ruins, ivied walls, and like places, often in a semi-domestic condition. One of the best accounts of it (and of the next named species) is to be found in Charles Waterton's *Essays*. Another generally interesting species is the 'little' owl of Southern Europe, called 'chevêche' by the French and 'civetta' by the Italians, which is the one regarded by the ancients as the familiar of Minerva, a symbol of wisdom, and hence became the emblem of Athens. It is the *Carine noctua* of modern ornithology. This small species is brown, mottled with white oval spots, has no 'horns,' and its great eyes are surrounded by horizontally oval disks, like big spectacles, giving it a very 'knowing' expression. It is numerous, comparatively tame, and lives well in aviaries.

The owl has from early times been deemed a bird of evil omen, and has been an object of dislike and dread to the superstitious. This is perhaps partly to be ascribed to the manner with which it is often seen, then as suddenly lost to view, when the twilight is deepening into night; partly to the fact that some of the best known ones frequent ruined buildings, while others haunt



1. LITTLE OWL of Europe (Carine noctua); symbol of Pallas Athene
2. HAWK OWL (Surnia ulula)
3. BARRED OWL (Syrnium, or Scotiaptex nebulosum).
4. GREAT HORNED OWL (Bubo Virginianus); type of Eagle Owls
5. BARN OWL (Strix flammea)
6. BURROWING OWL (Speotyto cunicularia)

the deepest solitudes of woods; but, no doubt, chiefly to the cry of some of the species, hollow and lugubrious, but loud and startling, heard during the hours of darkness, and often by the lonely wanderer. It is evidently from this cry that the word 'owl' is derived, as well as many of its synonyms in other languages, and of the names appropriated in different countries to particular species, in most of which the sound *oo* or *ow* is predominant. Nevertheless the notes of some of the smaller ones, as our common American 'mottled owl,' are low and melodious—a pleasant rippling ululation. Many of the owls have also another and very different cry, which has gained for more than one of them the appellation 'screech-owl,' and to which, probably, the Latin name *strix* and some other names are to be referred. The superstitions concerning owls persist and belong to savage as well as to civilized peoples. The folk-lore of the uncivilized world is full of such notions. European peasants connect the birds with death-signs; the Andalusians say they are the Devil's birds and drink the oil from the lamps in saints' shrines; and the Malagasy consider them embodiments of the spirits of the wicked. Even the birds and squirrels of the woods mob the owl unmercifully when one is discovered dozing in its retreat; but this is merely in recognition of a natural enemy taken at a disadvantage.

Bibliography. See standard ornithologies and faunal works, especially Newton, *Dictionary of Birds* (New York, 1893), and Evans, *Birds* (New York, 1900). For North America, consult the writings of Wilson, Audubon, Nuttall, Coues, and recent ornithologists, especially Fisher, *Hawks and Owls of the United States* (Washington, 1893). For superstitions, etc., consult: Brehm, *Naturgeschichte der Vögel Deutschlands* (Ilmenau, 1831; trans. into English as *Bird Life*, London, 1874); De Gubernatis, *Zoological Mythology* (London, 1872); De Kay, *Bird Gods* (New York, 1898); and authorities cited under Folk-Lore.

OWLET-MOTH. Any one of the night-flying moths of the family Noctuidæ. This is a large assemblage of moths of rather strikingly characteristic and rather uniform appearance, comprising in the United States more than 2100 species, which are almost without exception injurious to vegetation. The moths, as a rule, are of sombre colors, averaging perhaps 1.50 inch in wing expanse. The fore wings are comparatively narrow, rather short and stout, and crossed by a series of wavy lines, with two usually darker or paler spots near the centre of the wing. The hind wings are usually without markings, and when at rest are concealed by the fore wings, which overlap and cover them, either flat upon the back or roof-like. The body is large in proportion to the size of the wings. The thorax is heavy and quite stout, and in some species the scales on the upper surface are turned up, forming tufts. The abdomen is conical and extends beyond the inner angle of the hind wings when these are spread. The popular name, *owlet-moth*, is derived from the nocturnal habits of these insects, and from the fact that often when they are in obscurity their eyes shine brightly.

Some of the caterpillars are hairy, but the more typical ones are naked, and perhaps the most characteristic are the forms commonly known as cutworms (q.v.). They range from an inch to an inch and a half in length and have dull colors, ranging from dirty gray to dirty brown with a few longitudinal stripes. They hide during the day a little below the surface of the ground and often at the base of the plants upon which they feed, and during the night come out to eat whatever vegetation they can find. The eggs are laid on trees, stones, or leaves, and the larvæ hatch, as a rule, late in the summer, and pass the winter in a half-grown condition hidden beneath stones or logs or under the surface of the ground. In the spring they come out after this long fast and devour the new vegetation with avidity. Some of them will climb trees and are known as 'climbing cutworms.'

The army-worm (q.v.) is a famous member of this family, as are also the wheat-head army-worm, the fall army-worm, the cotton caterpillar of the South, and the tomato-worm. The best remedy consists in ridding the land prepared for gardens before setting out the plants, by distributing here and there bunches of freshly cut grass or other vegetation which has previously been poisoned with Paris green.

Consult: Edwards, *Standard Natural History*, vol. ii. (Boston, 1884); Smith, *Manual of Economic Entomology* (Philadelphia, 1896); Comstock, *Manual for the Study of Insects* (Ithaca, 1895).

OWLGLASS. See Eulenspiegel.

OWL-PARROT. See Kakapo.

OWNERSHIP. Although not strictly a legal term, 'ownership' is used frequently by legal writers to denote the highest degree or kind of property one can have in anything. 'Owner' is often used to denote one who has such property, as contradistinguished from the various terms used to signify one who has only a partial or temporary interest in property as lessee, tenant, licensee, bailee, or one having custody or possession. Strictly speaking, complete ownership at English law consists of title and possession united in the same person, although in common practice one is said to be the owner who has title, although he may not have actual possession of the property. In general, one who is the owner of property has absolute control over it and the right to do with it as he will so long as he does not interfere with the legal rights of others. See Dominium; Property; Real Property; Possession, Law of.

OWOS'SO. A city in Shiawassee County, Mich., 79 miles northwest of Detroit; on the Shiawassee River, and on the Ann Arbor, the Chicago and Grand Trunk, and the Michigan Central railroads (Map: Michigan, J 5). It is situated on both sides of the river, and has a ladies' library and several fine churches and school buildings. The Federal Government has made an appropriation for a new post-office building here. There are manufactures of furniture, caskets, door and window screens, dining-room tables, spokes, carriages, cars, packed meats, butter, machine shop products, hickory handles, knit goods, rugs, breakfast food, snow shovels, etc. The city is also the centre of an extensive sugar-beet industry, and has a large beet-sugar factory. Settled about 1832, Owosso was chartered as a city in 1859. The government is administered under a charter of 1895, which provides for a mayor, annually elected, and a council. The city

owns and operates the water-works. Population, in 1890, 6564; in 1900, 8696.

OX (AS. *oxa*, Goth. *aühsa*, *aühsus*, OHG. *ohso*, Ger. *Ochse*, *Ochs*, Welsh *ych*, Skt. *ukṣan*, ox, from *uks*, to sprinkle, or *ukṣ*, to be strong; in the latter case ultimately connected with Gk. *ἀέξειν*, *αὔξειν*, OHG. *wahsan*, Ger. *wachsen*, AS. *weaxan*, Eng. *wax*, to grow). The male of a bovine animal, especially one of the domestic races of cattle. The word in certain connections, as 'oxen' or 'ox tribe,' has come to stand for cattle in general. (See CATTLE.) An uncastrated male is a 'bull;' a young male a 'steer,' but the latter word, especially in the Western United States, is now used for beef-cattle in general, regardless of age or sex.

OXAL'IC ACID (from Lat. *oxalis*, from Gk. *ὀξαλίς*, sorrel, from *ὀξύς*, *oxys*, sharp, acid), $C_2H_2O_4.2H_2O$. A colorless crystalline substance with an intensely sour taste. It is soluble in nine parts of cold water, and much more freely in boiling water. When heated to 212° F., the crystals lose their two equivalents of water, and the residue, consisting of the anhydrous acid, $C_2H_2O_4$, becomes opaque. The anhydrous acid may be sublimed partly undecomposed by heating gradually and carefully. When heated rapidly it decomposes into carbonic and formic acids, the latter acid further breaking up into carbon dioxide, carbon monoxide, and water. When warmed with strong sulphuric acid, oxalic acid is decomposed into equal volumes of carbonic acid and carbonic oxide gases and water, according to the equation:

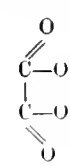
$C_2H_2O_4$	=	CO_2	+	CO	+	H_2O
Oxalic acid		Carbonic acid gas		Carbonic oxide		Water

This reaction affords one of the best means of obtaining carbonic oxide for use in the laboratory. Oxidizing agents, such as manganese dioxide, peroxide of lead, nitric acid, etc., convert oxalic into carbonic acid, and on this property is based a good method of determining the commercial value of the black oxide of manganese.

Oxalic acid is one of the most powerful of the organic acids, and expels carbonic acid and many other acids from their salts. The acid itself and its soluble salts are poisonous. This acid is very widely diffused throughout the vegetable kingdom. Sometimes it occurs in a free state (as in *Boletus sulphureus*), but much more frequently as a salt, either of potash, as in the different species of Oxalis (from which genus the acid was originally obtained and derives its name) and of Rumex; or of soda, as in various species of Salicornia and Salsola; or of lime, as in rhubarb and many lichens. In the animal kingdom it never occurs except in minute quantity and in combination with lime. Oxalate of lime is found in a crystalline shape, both in healthy and morbid urine, and is the chief constituent of the urinary calculus known from its rough exterior as the mulberry calculus.

Oxalic acid is produced by the action either of hydrate of potash or of nitric acid upon most organic compounds of natural occurrence. Its most common mode of preparation is by the oxidation of starch or sugar by nitric acid. The organic compound and the nitric acid are heated in a flask till all effervescence has ceased, after which the solution is evaporated, and the oxalic acid separates in crystals on cooling.

The molecule of oxalic acid is composed of two carboxyl groups (COOH) and is represented graphically by the following formula:



Oxalic acid

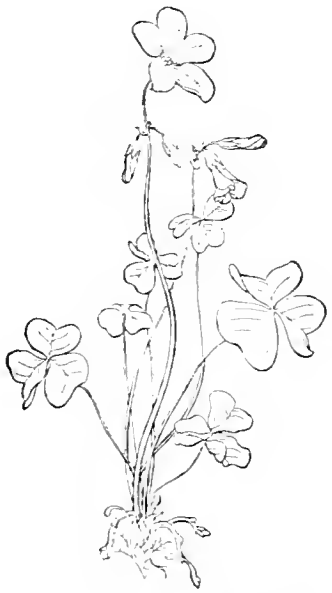
Of the numerous *oxalates* the most important are the oxalate of lime (in consequence of its physiological and pathological relations); the neutral oxalate of ammonia, which is the best test for the detection of lime in solution (in consequence of the extreme insolubility of the resulting oxalate of lime); and the acid oxalate of potash, which is employed in various manufacturing processes, as well as for removing ink and rust stains. When the neutral oxalate of potash is mixed with sulphate of iron, a double oxalate of iron and potassium is produced. This compound is a strong reducing agent, and has the power of separating metals (for instance, silver) from their salts; this property is made use of in photography.

The best test for oxalic acid is the production of a white precipitate (of oxalate of lime), on the addition of any soluble salt of calcium. The precipitate is insoluble in water, in solution of potash, and in acetic acid, but dissolves in the mineral acids. A solution of nitrate of silver also gives a white precipitate of oxalate of silver, which explodes when heated.

In consequence of its employment in printing cotton, bleaching straw, etc., oxalic acid is more accessible to the general public than many other poisons, and on this account instances of suicide from the swallowing of this acid are by no means uncommon. Cases of accidental poisoning, moreover, sometimes occur by its being sold by mistake for Epsom salts. Large doses destroy life very rapidly. The symptoms of oxalic acid poisoning are a burning acid taste, with a sense of constriction or suffocation; vomiting, great pain in the region of the stomach, convulsions, cold perspirations, and general collapse speedily follow; and respiration shortly before death becomes slow and spasmodic. With the view of converting the free acid in the stomach into an insoluble and inert salt, chalk, whiting, or lime water, with full draughts of milk, should be administered with the least possible delay. Salt of sorrel is almost as poisonous as the pure acid. See ANTIDOTE.

OXALIS (Lat., from Gk. *ὀξαλίς*, sorrel). A genus of the natural order Geraniaceæ, according to Bentham and Hooker, including herbs and shrubs with generally compound alternate digitate or ternate, rarely simple or pinnate leaves. There are upward of 200 known species, natives of warm and temperate climates, particularly abundant in North America and at the Cape of Good Hope. The genus Oxalis has a capsular fruit, and the seeds have an elastic integument, which, bursting open, projects the seed to a distance. The stems and leaves generally contain a notable quantity of binoxalate of potash, and have, therefore, a sour taste. The common wood sorrel (*Oxalis Acetosella*), very

abundant in shady woods and groves in most parts of Europe, a native also of North America, is a beautiful little plant, often covering the ground with its green leaves, amid which the white or slightly roseate flowers appear. Its leaves all grow from the rootstock, a long leaf-stalk bearing three obovate leaflets, the scape a



VIOLET WOOD SORREL (*Oxalis violacea*).

single flower. On account of their grateful acid taste, due to oxalic acid (q.v.), the leaves are used in salads and sauces. The plant is extremely abundant in Lapland, and is much used by the Laplanders. *Oxalis corniculata*, a plant of very extensive distribution, being found in Europe, North America, India, Japan, and some of the African islands, has a branched stem, with decumbent branches, leaves very similar to those of the common wood sorrel, and yellow flowers. Its properties agree with those of the common wood sorrel. Many other species resemble these in general appearance and properties. The leaves of some of the species exhibit an irritability like that of the sensitive plant, generally in a slight degree, and notably only in hot sunshine, but *Oxalis sensitiva* or *Biophytum sensitivum*, an East Indian species, with pinnate leaves, possesses this property in a high degree. Some species, as *Oxalis cernua*, a native of South Africa, are remarkable for producing large bulbels in the axils of the lower leaves. Several species have tuberous roots, and are cultivated on account of their tubers, as *Oxalis crenata* and *Oxalis tuberosa*, natives of Peru and Bolivia, where they are much esteemed, both receiving the name oca. The tubers when cooked become mealy like potatoes. They have a slightly acid taste. *Oxalis crenata* has been cultivated in gardens for many years, but continues to be almost exclusively an object of curiosity, being too tender for temperate climates and its product very inconsiderable in quantity. Its tubers are yellow, in size and shape like small potatoes. The succulent stalks of the leaves abound in a pleasant acid juice, and make excellent tarts and preserves. *Oxalis tuberosa* produces numerous small tubers. The Bolivians often expose them for a long time to the sun, by which they lose acidity, become saccharine, and acquire a taste and consistence like dried figs. *Oxalis Deppei* is a Mexican species, with a root somewhat like a small parsnip, quite free of acidity. It is much cultivated in its native country, and succeeds well in the southern parts of England. *Oxalis tetraphylla* and *Oxalis crassicaulis*, natives of Mexico, and *Oxalis enneaphylla*, a native of the Falkland Islands, also have edible roots. Many species of Oxalis are much esteemed as ornaments of gardens and greenhouses.

OXALURIA (Neo-Lat., from Eng. *oxal-ic* + Gk. *οὖρον*, *ouron*, urine), or OXALIC ACID DIATHESIS. A morbid condition of the system, in which one of the most prominent symptoms is the persistent occurrence of an excess of crystals of oxalate of lime in the urine. Oxalate of lime is normally present in the urine, held in solution by the acid sodium phosphate. The amount excreted daily varies greatly within the limits of health, being largely increased by eating tomatoes, rhubarb, cranberries, and the like. The diet, therefore, must always be taken into account in estimating the pathological importance of an excess of the oxalates. When present in excess for a considerable period of time, the condition is known as oxaluria. The accompanying train of symptoms are depression, irritability, nervous indigestion, hypochondriasis, melancholia. There may be neuralgic pains, a sense of weight across the loins, and the characteristic symptoms of neurasthenia. The causes of oxaluria are not quite clear, but the trouble is believed to be due to faulty assimilation and imperfect oxidation of certain foods. It occurs in lithæmia, and is thought to be related to gout. The persistent occurrence of large amounts of calcium oxalate in the urine is also of special interest, because the crystals may be deposited before the urine is voided, and form the so-called mulberry calculi in the bladder or the pelvis of the kidney.

The treatment of this condition should look toward building up the general health, and improving the digestion by outdoor exercise and the administration of bitter tonics and the mineral acids. Articles of diet containing oxalic acid should be avoided, as should also the starches and sugars, which consume all the available oxygen and interfere with albuminous transformation.

OX-BIRD, or OX-EYE. The dunlin (q.v.).

OX'ENBRIDGE, JOHN (1608-74). An English nonconformist divine. He was born at Daventry, Northamptonshire. He was educated at Oxford and Cambridge, taking his degree at the latter university in 1631; was tutor of Magdalen Hall, Oxford, but was deprived of the position in 1634 for persuading the students to subscribe certain religious articles prepared by himself. He was ordained a minister of the Church of England, and spent the next few years as a missionary in the Bermuda Islands. In 1641 he returned to England and preached in various places; in 1652 he was chosen fellow of Eton College, ejected in 1660, and settled at Berwick-on-Tweed, where he preached till in 1662 he was silenced for non-conformity by the Act of Uniformity. He then went as a missionary to Guiana, and in 1669 went to Boston, where he

was installed in 1670 as colleague of the Rev. James Allen over the first church of that city. His publications are: *A Double Watchword* (1661), *A Seasonable Proposition of Propagating the Gospel by Christian Colonies in the Continent of Guiana* (1670); *Election Sermon* (1672); and *A Sermon on the Seasonable Seeking of God*.

OX'ENDEN, Ashton (1808-92). Metropolitan of Canada. He was born at Broome Park, near Canterbury, and was educated at University College, London; he was rector of Pluckley with Pevington, in Kent (1849-69). In 1864 he became honorary canon of Canterbury Cathedral, and in 1869 was chosen Bishop of Montreal, and Primate and Metropolitan of Canada. He resigned his bishopric in 1878 because of age, and was vicar of Saint Stephen's, Canterbury, and also rural dean of Canterbury (1879-84). Among his publications may be mentioned: *The Cottage Library* (6 vols., 1846-51); *The Pathway of Safety* (1856); *Cottage Readings* (1859); *The Home Beyond* (1861); *The Parables of Our Lord Explained* (1864); *A Plain History of the Christian Church* (1864); *My First Year in Canada* (1871); *A Simple Exposition of the Psalms* (1872); *The Christian Life* (1877); *Counsel to the Confirmed* (1878); *Touchstones* (1884); *Short Comments on the Gospels* (1885). Consult his autobiography (London, 1891), and his posthumous *Plain Sermons* (ib., 1893), with memoir.

OX'ENFORD, John (1812-77). An English translator and dramatic writer, born at Camberwell, London, August 12, 1812. He was apprenticed for the law, but he gave it up for literature. Unaided by the schools, he mastered German, Italian, French, and Spanish. From these languages he made many translations which have been highly commended. Among them are Calderon's *Vida es sueño;* Molière's *Tartufe;* Boiardo's *Orlando innamorato* (incomplete); Goethe's *Dichtung und Wahrheit;* and Eckermann's *Gespräche mit Goethe.* In an essay entitled *Iconoclasm in Philosophy,* contributed to the *Westminster Review,* he first made Schopenhauer known to England. Oxenford's dramatic pieces probably number more than a hundred. Not only were they popular at home, but several of them were translated into French, German, and Dutch. Among them are *My Fellow Clerk, A Day Well Spent,* and *Twice Killed.* In 1850 or thereabouts, Oxenford joined the staff of the London *Times* as dramatic critic. In 1867 he visited the United States. He died at Southwark, February 21, 1877.

OXENHAM, ŏks'en-am, Henry Nutcombe (1829-88). An English theologian, eldest son of William Oxenham, an English clergyman and second master of Harrow School, born at Harrow, November 15, 1829. From Harrow he passed to Balliol College, where he graduated B.A. in 1850 and M.A. in 1854. Ordained in the English Church, he became curate of Worminghall, Buckinghamshire (1854), and at Saint Bartholomew's, Cripplegate, London (1856). From the first a high churchman, he went over to the Roman Catholic Church in 1857. He was subsequently appointed professor in Saint Edmund's College, Ware, and master of the Oratory School at Birmingham. He died at Kensington, March 23, 1888. Besides contributing to periodicals, he published extensively. Among his works are: *The Sentence of Kaires and Other Poems* (1854); *The Catholic Doctrine of Atonement* (1865); *Dr. Pusey's Eirenicon* (1866; 2d ed. 1871); *Catholic Eschatology and Universalism* (1876); *An Eirenicon of the Eighteenth Century* (1879); and *Short Studies in Ecclesiastical History and Biography* (1884-85). Oxenham studied for a time in Germany under Döllinger, several of whose works he translated into English.

OXENSTIERNA, or **OXENSTJERNA,** ŏk'sen-shär'nȧ (often called Oxenstiern by English writers), Axel, Count (1583-1654). A Swedish statesman, born at Fänö, in Upland, June 16, 1583. He studied at Rostock, Jena, and Wittenberg, his original interest being in theology, to which he devoted his attention. After leaving the university, he visited most of the German courts, but returned to Sweden in 1603, and soon afterwards entered the service of Charles IX., who, in 1606, dispatched him as Ambassador to the Court of Mecklenburg. He became a Senator in 1609. He conducted with marked discretion the settlement of certain disputes between the Livonian nobles and the town of Reval, and was appointed guardian of the royal family and head of the regency when Charles became incapacitated. On the accession of Gustavus II. Adolphus (q.v.) in 1611 Oxenstierna was made Chancellor. In 1613 he acted as plenipotentiary in the negotiations for peace between Sweden and Denmark, and he arranged the Peace of Stolbova with Russia in 1617. In 1621 he conducted the administration at home during the absence of the King, who was carrying on the war with Poland. Subsequently he was appointed Governor-General of the conquered district, and in 1629 concluded peace with the Poles on highly favorable conditions. For a while Oxenstierna strongly opposed the desire of Gustavus Adolphus to take part in the Thirty Years' War, but when he found that the King had determined on his course he set about collecting money and troops with energy and persistency. After Gustavus Adolphus had fairly entered on the sanguinary struggle, Oxenstierna joined him, and conducted most of the extensive and complicated diplomacy which the course of events entailed on Sweden. After the death of the King, at Lützen, November 16, 1632, he resolved to continue the contest with the Imperialists, in spite of the visible disaffection of many of the German Protestant princes. At the Congress of Heilbronn the States of Swabia, Franconia, and the Rhenish territories placed Oxenstierna at the head of the Evangelical League (1633). The will of the dead monarch was sent to Stockholm; according to its conditions the government—during the minority of his daughter Christina (q.v.)—was intrusted to five nobles, who empowered the Chancellor to prosecute the war. His difficulties were enormous, yet he managed partly to allay the rivalries of the Protestant leaders. After the severe defeat of the Swedes at Nördlingen in 1634 Oxenstierna transferred the leadership of the Protestant forces to Duke Bernhard of Weimar, and proceeded, in 1635, to France and Holland, to obtain aid against the Imperialists. Returning to Germany, he assisted in quelling a mutiny among the Swedish troops at Magdeburg; put Pomerania in a state of defense to resist the expected attack of the Elector of Brandenburg; renewed the treaty with Poland; and,

leaving Banér in command of the Swedes, returned to Stockholm in 1636. In 1645 he represented Sweden at the Peace of Brömsebro with Denmark. He continued to direct ably the policy of the Protestants in Germany, till the Peace of Westphalia, in 1648, put an end to the war. Oxenstierna's son was one of the Swedish envoys who signed the treaty, and it is in a letter to him that the famous sentence of the statesman occurs: *Nescis, mi fili, quantilla prudentia homines regantur* ("You do not know, my son, with how little wisdom men are governed"). Queen Christina did not show a proper respect for the advice of Oxenstierna and persisted in her resolve to abdicate in spite of all his protestations. Oxenstierna died August 28, 1654. Some treatises and historical fragments are attributed to him. Consult: Geijer, *Geschichte Schwedens* (3 vols., Hamburg, 1823-36). See references under GUSTAVUS II. ADOLPHUS.

OXENSTIERNA, JOHAN GABRIEL, Count (1750-1818). A Swedish poet and statesman. He studied under the poet and critic Olof Bergklint, served a year in the Chancellor's office, and then entered the diplomatic corps as secretary of legation in Vienna (1770). Returning to Sweden in 1774, he became King's chamberlain, enjoyed high favor at Court and held various high offices there, being Marshal of the Realm from 1792 to 1801. Oxenstierna was one of the first members of the Swedish Academy on its formation in 1786. He edited the papers of King Gustavus III. (1803-12), and translated Milton's *Paradise Lost* and a part of Tasso's *Gerusalemme liberata;* but he is better known for his own poetic works. *Skordarne* and *Dagens Stunder* are especially famed among his works for their beautiful descriptions of nature. In general his poetry is marked by a high order of imagination and a euphonious style, but it is not free from the pseudo-classicism of the period. His complete works were published at Stockholm (1805 to 1826). Selections from his diary were edited by Stiernström (Upsala, 1881). Consult Wirsén, *Minne af riksmarkalken grefve J. G. Oxenstierna* (in the *Transactions of the Swedish Academy*, Stockholm, 1885).

OX-EYE. (1) The dunlin (q.v.). (2) The semipalmated sandpiper (*Ereunetes pusillus*). (3) In Great Britain, the common larger titmouse (*Parus major*).

OXEYE. An ornamental plant. See CHRYSANTHEMUM; DAISY.

OX'FORD. The chief city and county-seat of Oxfordshire, England, and the cathedral town of the Diocese of Oxford. It is situated 52 miles (63 by rail) west-northwest of London, at the junction of the Isis (Thames) and Cherwell rivers (Map: England E 5). Its chief importance is due to its university. Oxford is a place of considerable antiquity, probably owing its origin to the shrine of Saint Frideswide, in whose honor a religious house was founded perhaps as early as the ninth century. The name is probably derived from Ousenford, or ford over the Ouse, a tributary of the Thames which comes in here, though the city arms, an ox crossing a ford, indicate a more popular etymology, Oxen-ford. Coins of King Alfred were struck here—a fact which testifies to the prominence of the place even in his day; but the first mention in written history is in the Chronicle under the year 912, when it was annexed or reannexed to the West Saxon Kingdom. It came to be a place of some importance as the key to the valley of the Upper Thames and in control of much of the trade of that region. It was a place of military significance and was possessed of fortifications, of which the great mound is still in existence. Its increasing prominence is shown in the more and more frequent mention in the Chronicles as a place of meetings and treaty-makings. At the Conquest it became part of the possessions of Robert D'Oyly, who built the castle, the keep of which still remains. It was fortified with a strong wall, and became a place of much importance, especially connected with royalty. Henry I. built a house or palace here. Queen Matilda was here besieged by Stephen; here both Richard I. and John were born, and here was held the Parliament of 1258, which enacted the Provisions of Oxford. The rise of the university attracted hither many religious Orders, and during the greater part of the period before the Reformation the chief interest of the place lies in the growth and struggles of the university (q.v.). In later times its chief historical significance lies in the part it played in the civil wars, when for a considerable time it was not merely the centre of Royalist operations, but the capital of Royalist England. It was besieged by the Parliamentarians, but fortunately not bombarded.

Despite its low-lying position amid the marshes of the many-branched Thames, surrounded by hills, Oxford is a very beautiful city, owing chiefly to the presence of the collegiate and university buildings. The centre of the city is Carfax (quatre voies), where the north and south ways (Cornmarket and Saint Aldate's) and the east and west ways (Queen Street and High Street) meet. High Street is the principal street of the place and is one of the most attractive thoroughfares in England. The chief architectural features of the place, in addition to the college and university buildings, are the very handsome new municipal buildings, begun in 1893, His Majesty's Prison, occupying the site of the old castle, and many interesting churches, including Saint Martin Carfax, the old city church, Saint Michael's, with an interesting Saxon tower, Saint Peter's in the East, with a Norman crypt, and many others. The city has much outgrown its former bounds, especially toward the north, in recent years, and is now surrounded by suburbs: North Oxford; Grandpont, on the south, reached by Folly Bridge over the Isis; Cowley, on the east, reached by Magdalen Bridge over the Cherwell; and Osney on the west. In 1901 Oxford had a population of 49,413. It is a Parliamentary and municipal borough, returning two members to the House of Commons besides the two from the university. It is governed by a mayor, ten aldermen, and thirty councilors, forming the corporation, a high steward, a sheriff, and a recorder. The jurisdiction of the civic government, however, does not extend over members of the university. It is a market town, has now some manufactures, and an increasing municipal importance. See OXFORD UNIVERSITY.

OXFORD. A city and the county-seat of Lafayette County, Miss., 73 miles southeast of Memphis, Tenn.; on the Illinois Central Railroad (Map: Mississippi, F 2). It is most important as an educational centre, having the State University (q.v.), and the Woman's College (Methodist Episcopal), opened in 1854. A Federal court's

building is located in Oxford. The leading industries are connected with cotton. Population, in 1890, 1546; in 1900, 1825.

OXFORD. A town and the county-seat of Granville County, N. C., 36 miles north of Raleigh; on the Seaboard Air Line and the Southern Railroad (Map: North Carolina, D 1). It has two private secondary schools, a Masonic orphan asylum, and an asylum for colored children. Oxford is in the fertile Piedmont section of North Carolina, the centre of extensive tobacco-growing interests. There are, besides several tobacco warehouses and stemmeries, cotton mills, a furniture factory, an iron foundry, a carriage factory, planing mill, etc. Population, in 1890, 2907; in 1900, 2059.

OXFORD. A village in Butler County, Ohio, 39 miles north by west of Cincinnati; on the Cincinnati, Hamilton and Dayton Railroad (Map: Ohio, A 7). It is a prominent educational centre, having Miami University (q.v.), and two colleges for women—Oxford College, opened in 1849, and Western College, opened in 1855. Population, in 1890, 1922; in 1900, 2009.

OXFORD, Provisions of. A set of regulations drawn up in 1258 for the government of England. In that year Henry III.'s difficulties with his barons had come to a head, and loud complaints were made when Parliament met at London on April 9th. Finally the King gave his consent to the formation of a committee of twenty-four, chosen half from the royal council and half by the barons, to propose reforms. On June 11, 1258, Parliament met at Oxford, and this Mad Parliament, as it was called, caused the adoption of a new scheme of government, now known as the Provisions of Oxford. A council of fifteen was selected in a complex manner, and this was to advise the King in all matters of government, and three times a year was to meet twelve representatives of the barons to discuss the whole state of affairs. This method of government lasted until 1263, with a short interruption in 1259. In 1263, however, war between Henry III. (q.v.) and his barons, led by Simon de Montfort (q.v.), began. Consult Stubbs, *Constitutional History of England*, vol. ii. (4th ed., Oxford, 1896).

OXFORD, Robert Harley, First Earl of. An English statesman. See Harley, Robert, Earl of Oxford.

OXFORD CLAY. An important formation of Middle Jurassic age found in England. It consists of dark-blue or blackish clay which sometimes reaches a thickness of 600 feet. The Oxford clay lies beneath the plain on which Oxford is built.

OXFORD MOVEMENT. The name commonly applied, from its place of origin, to the revival of the doctrines and practices of an earlier age which took place in the Church of England in the early years of the Victorian era. Though local in its inception, it achieved unexpected results and became world-wide in its influence. The movement proper, or the stage of it which is more strictly known as Tractarian, covered a period of twelve years. It began with Keble's famous sermon on national apostasy preached in Saint Mary's, Oxford, in July, 1833, and closed with Newman's defection in 1845. But under other leaders the work went on. Its field of operations was widened. It moved along new lines and gathered fresh strength, until it vivified and transformed the English Church.

It was distinctly a revival, but of a different type from those which had preceded it in the seventeenth and eighteenth centuries. That of the seventeenth century was anti-Calvinistic and based on the moral responsibility of man. That of the eighteenth was anti-latitudinarian and based on devotion to a personal Redeemer. The Oxford Movement was anti-individualistic and based on the incarnate life of Jesus Christ. The revival of spiritual life under the Wesleys and Whitefield was intensely subjective and therefore one-sided and imperfect. Its complement was furnished by the Oxford Movement with its deep religious fervor, but distinctly objective teaching. To attempt to gauge the movement simply by its restoration of obsolete external observances is to miss its meaning. It had a double trend, historical and doctrinal.

Historically it was part of a larger movement. The beginning of the nineteenth century marked an epoch in religious thought. The Deism of the preceding century, with its mechanical universe and absentee God, had induced an all-pervading deadness in spiritual things. Religion was little better than a cold morality. A reaction was inevitable. The search was for authority; the transcendental school found it in an 'inner light,' in reason or conscience or 'an imaginative faith;' the ecclesiastical school appealed to the authority of the Church and localized the divine in persons and places and acts. Transcendentalism saw God in man and nature, ecclesiasticism saw Him in sacraments and ordinances. In England at the beginning of the nineteenth century the Church had became so thoroughly Erastian that few looked beyond the State with its civil courts for any centre of ecclesiastical authority. The most definite form of ecclesiasticism, though one little known to the great majority of Englishmen, was the Latin communion with its persistent assertion of Papal claims; and over against this stood the Transcendental school with its equally persistent demand for the recognition of the individual reason. But with the birth of the Oxford Movement in England came the appeal to the authority of the historic Catholic Church, of which, it was contended, the national Church of the country was an integral part. According to Dean Church, it was not until Newman determined to force upon the public mind, in a way that could not be evaded, the great article of the creed, "I believe in one Catholic and Apostolic Church," that the movement really began. Underneath the restoration of certain external requirements lay this appeal to the authority of the primitive and undivided Church. The effort was to make the national Church of England more truly Catholic, not by the introduction of new features in her economy, but by the restoration of those elements of Catholicism which were already inherent, though latent, in her constitution. The movement sprang from the Catholic teaching of the Caroline divines. Its fathers were Andrewes and Laud and Cosin. It made episcopacy essential not merely to the *bene esse*, but to the *esse* of the Church. The Apostolic Succession became a prominent plank in the platform of the Catholic school.

The doctrinal teaching may be summed up in one word—the Incarnation. This, as witnessed

by Church and Scripture, was the sum and substance of the apologetic work of both the early and the later leaders of the movement. Underneath the contention as to holy orders and valid sacraments lay this basic truth of Christianity. It gave the world a living Christ, whose quickening and energizing humanity permeated the whole body of the faithful. He, it was held, inspired sermons, gave vitality to worship and efficacy to sacraments, and imparted energy both to individual lives and to corporate agencies for good. The sacraments were openly proclaimed as 'the extension of the Incarnation.'

The immediate cause of the movement was the suppression by the reform Government in 1833 of ten Irish bishoprics, coupled with the significant hint to the English prelates to 'set their house in order.' John Keble, professor of poetry at Oxford, had long chafed under the manifest Erastianism of the times; and what the poet had already sung, in the *Christian Year*, the preacher now proclaimed from the pulpit. But if Keble's sermon was the first word, the first step was taken at a meeting of a few friends at Hadleigh vicarage, in Suffolk, the home of Hugh James Rose, in July of the same eventful year. It was there decided to begin the publication of the *Tracts for the Times*, and the decision opened a new era in Christian polemics. The first three tracts appeared under date of September 9, 1833, and during that and the following year forty-six were printed and circulated among the parochial clergy. They were short but incisive statements, bearing upon the polity, doctrine, and worship of the Church. In 1834 an address signed by seven thousand clergymen of the English Church, expressing a general adherence to her apostolic doctrine and polity, was presented to Archbishop Howley, and this was followed by another of the same purport from the laity bearing the signatures of two hundred and thirty thousand heads of families. An 'association' was formed by William Palmer, and a short supplement to the Catechism was prepared and published by William Perceval. But the 'Oxford Tracts' were the motive power of the new movement and its leaders were soon known as 'Tractarians.'

Concurrent with the issue of the Tracts were Newman's four o'clock sermons at Saint Mary's. They were plain, but pointed and pungent. Men read the Tracts and listened to the sermons. An atmosphere was created and in it the urgent issues of the hour were discussed and weighed. Toward the close of 1834 Pusey joined the movement. As a professor and a canon of Christ Church, Oxford, he brought with him a name and a position. The Tracts grew into heavier and more exhaustive treatises. A translation of the early Fathers was begun. The Anglo-Catholic library was started. The movement met with unexpected success, and, under the leadership of Newman, Keble, and Pusey, gathered great strength in the effort to return, in doctrine and worship, to the Anglicanism of the seventeenth century.

But in 1839 a new school was formed within the movement which from that year until 1845 had a large, if not the chief, share in its guidance. It originated with William George Ward and other younger men who came into it, as Newman afterwards said, "at an angle and were sweeping the original party aside." It is said to have represented the ethical and philosophical side of the effort rather than the historical. The sympathies of its leading spirits were distinctly Roman. The vivid picture of Church authority and Catholic sanctity painted in Hurrell Froude's *Remains* fascinated many earnest and devout minds. The Protestant Reformation was represented as a deadly sin, and restoration to communion with Rome was the ideal. There was clearly a rift in the Tractarian forces. Ward's party were drifting toward the Roman Catholic Church. Pusey and Keble stood firm on the original foundation. Newman was unsettled. "The large and sweeping conception of a vast and ever-growing Imperial Church," we are told, "appealed strongly to his statesmanlike imagination." Flaws and imperfections were of no account in such greatness and could be overlooked. In 1839 his sympathies were strongly Roman Catholic. He had striven to present the Church of England as holding a central historic position between a bald Protestantism on the one hand and an infallible Roman Catholicism on the other. His appeal had been to the authority of the undivided Church. But his belief in the reality of the English Church was now being severely tested. While studying the Monophysite question in the summer of that year he says himself: "For the first time a doubt came across me of the tenableness of Anglicanism. I had seen the shadow of a hand on the wall. He who has seen a ghost cannot be as if he had never seen it. The heavens had opened and closed again. The thought for the moment had been, the Church of Rome will be found right after all. And then it had vanished. My old convictions remained as before."

Still the movement went on, with no outward signs of failure. But with the publication of Tract 90 there came a marked change. It was written by Newman, and interpreted the articles in what Ward called a 'non-natural' sense. It was an attempt to show, by an ingenious application of Article XXXV, on the Homilies, that the Articles were not necessarily anti-Roman. They were represented as condemning the popular exaggerations and misconceptions of Roman doctrine current at the time they were drawn up. This was enough in the temper of the times to let the storm loose. Dislike and suspicion had been seething, conspiracy and disloyalty had been darkly hinted; but with the appearance of the obnoxious Tract, the innate Protestantism of England flew to arms. The Tracts were stopped. Newman withdrew from Oxford to Littlemore. Saint Augustine's words about the Donatists, "Securus judicat orbis terrarum," kept ringing in his ears "like words out of the sky." The ghost came again, and this time it would not leave him. The attempt to establish a joint bishopric at Jerusalem, representing both the English Church and the Prussian Lutherans, pressed hard upon a sensitive and over-strained conscience. The Government and the Archbishop appeared guilty of the sacrifice of principle. Then came Pusey's suspension for his sermon on the Eucharist in 1843, followed by the condemnation of Ward's *Ideal of a Christian Church*, and the withdrawal of his degrees in the next year. By the summer of 1845 he and Faber and Oakeley had gone over to Rome, and in October the long impending blow fell. Newman transferred his allegiance from the Anglican to the Latin Obedience.

The catastrophe shattered the Tractarian

Party; it checked but did not stop the Oxford Movement. The influence of the revival had already reached far beyond the Church in England. The events connected with the Carey case in America are sufficient to show this. Arthur Carey was a graduate of the General Theological Seminary in New York, and a young man of unusual promise; but he had become imbued with the teaching of the Tractarians, and a protest was entered against his ordination on the ground that he was unsound in the faith. He was, however, after the case had caused considerable excitement, ordained when he had passed a special examination by a committee of clergymen appointed for the purpose. The movement became the subject of an able and earnest debate in the American General Convention of 1844. Resolutions were adopted to the effect that the faith was already sufficiently proclaimed in the formularies of the Church, and that the canons were amply adequate to govern any cases of supposed heterodoxy. Victory seemingly rested with the advanced or Catholic school.

Another blow fell in England when the Judicial Committee of the Privy Council gave its decision in the famous Gorham case. (See GORHAM CONTROVERSY.) The court merely decided that the language used by Mr. Gorham was not so clearly contrary to the formularies of the Church as to justify the action of the Bishop in refusing to institute him; but it was understood by many people to declare that the Church of England did not teach the doctrine of Baptismal Regeneration. It was looked upon by the High Anglicans as a further proof of the inherent and ineradicable Erastianism of the National Church. A number of clergymen sought refuge in the Roman Catholic Communion, the foremost of whom was Manning. But the movement widened and went on, its work becoming more practical and less argumentative. Signs of the revival of church life were everywhere manifest. New parishes were formed, new churches built. Interest in foreign mission was aroused. Men like Dr. Hook of Leeds, Bishop Wilberforce of Oxford, Mr. Gladstone, Judge Coleridge, and Sir Roundell Palmer (afterwards Lord Selborne) were found coöperating with the old and tried leaders. Doctrinal interest centred in the Holy Communion. The Real Presence and its corollary, the Eucharistic Sacrifice, were openly and widely taught and found expression in a revived and elaborate ritual. (See RITUALISM.) In 1856 proceedings were taken against Archdeacon Denison of Taunton, and in 1871 against Mr. Bennett of Frome, for teaching the Real Presence. But the result in both cases strengthened rather than weakened the position of the Catholic school. In the American Church Dr. De Koven fearlessly took his stand upon the English decision in support of the doctrine of the Real Presence as coming "within the limits of the truth held in the Church of England." It has since held a recognized place in Anglican theology, and the doctrine of the Sacrifice of the Eucharist was clearly defined and ably championed by the English archbishops in their reply to the Papal declaration against the validity of Anglican orders in 1897.

It is held by some that the real tendency of the Catholic movement was to Latinize the Church. The very principle of historic continuity for which the leaders fought and struggled has been designated as 'absurd and contradictory.' Its failure to 'trust the divine constitution of man' has been commented on, and we are told that it was too Augustinian in its theology. Froude maintained that the skepticism of England, in its leading principles, was introduced by Newman and that but for the Oxford Movement it would have remained 'a harmless speculation of a few philosophers.' It is also charged that the Mansell philosophy, with its unknown and unknowable God, was the culmination of its thought. It had its weak points, no doubt. But it had its strong features. It stood for great and forgotten truths. It rallied to it the learning and culture and intellect of England and other lands. It not impossibly anticipated, as some of its critics contend, the Higher Criticism and the agnosticism of the present day. It certainly begat the Neo-Oxford school whose views appeared in *Lux Mundi* in 1890, and who contend that the Church should assimilate the results of the ripest scholarship and the most searching scientific investigation.

Yet it is indisputable that the movement counts for much in the marvelous change which has taken place in religious life and work since the middle of the nineteenth century. Among its results may be placed the restoration of order and dignity to public worship; the more diligent ministration to the poor and distressed; the raising of the standard of clerical work; the foundation of religious communities for both men and women; the multiplication and maintenance of educational facilities; and the taking by the Church of England of a securer hold upon the affections of the people.

The bibliography of the Movement is very extensive, and includes some of the best biographical work in the language. Consult, especially: Church, *The Oxford Movement* (London, 1891); Oakeley, *Historical Notes on the Tractarian Movement* (ib., 1891-92); Newman, *Apologia pro Vita Sua* (ib., 1864); his *Letters and Correspondence During His Life in the English Church*, ed. by Anne Mozley (ib., 1891); Abbott, *The Anglican Career of Cardinal Newman* (ib., 1892); Liddon, *Life of Pusey* (4 vols., ib., 1893-97); Williams, *Autobiography*, ed. Prevost (ib., 1892); Froude, R. H., *Remains* (ib., 1838-39); Lock, *John Keble* (ib., 1893); Church, *Life and Letters of Dean Church* (ib., 1894); Purcell, *Life of Cardinal Manning* (ib., 1895); Hutton, *Cardinal Manning* (ib., 1892); Mozley, T., *Reminiscences, Chiefly of Oriel College and the Oxford Movement* (ib., 1882); Mozley, J. B., *Letters*, ed. by his sister (ib., 1884); Wilfrid Ward, *William George Ward and the Oxford Movement* (ib., 1889); id., *William George Ward and the Catholic Revival* (ib., 1893); Donaldson, *Five Great Oxford Leaders* (ib., 1898); Pattison, *Memoirs* (ib., 1885); Bowden, *Life and Letters of F. W. Faber* (ib., 1869); Browne, *History of the Tractarian Movement* (Dublin, 1856); Perceval, *Collections of Papers Connected with the Theological Movement of 1833* (London, 1842); Allies, *A Life's Decision* (ib., 1880); Burgon, *Lives of Twelve Good Men* (ib., 1888); Bennett, "Some Results of the Tractarian Movement of 1833," in Shipley, ed., *The Church and the World* (ib., 1867); Ornsby, *Memoirs of James Robert Hope-Scott* (ib., 1884); R. H. Hutton, *Some Modern Guides of Thought in Matters of Faith* (ib., 1887); Tulloch, *Movements of Religious Thought in Britain* (ib., 1885); Abbott and

Campbell, *Life and Letters of Benjamin Jowett* (ib., 1897); Martin, *Life and Letters of Robert Lowe, Viscount Sherbrooke* (ib., 1893); Prothero, *Life and Correspondence of Dean Stanley* (ib., 1893).

OX'FORDSHIRE. An inland county of England, bounded north by Warwick and Northampton, east by Buckingham, south by Berkshire, from which it is partly separated by the River Thames, and west by Gloucestershire (Map: England, E 5). Area, 750 square miles. The surface is varied, level toward the north and west; undulating and fertile along the Thames Valley and in the southeast, reaching an altitude of 820 feet in the Chiltern Hills. The principal rivers are the Thames, the Thame, the Cherwell, the Evenlode, and Windrush. The soil is fertile; agriculture is in an advanced state, a large proportion of the acreage being under crops or grass. Dairy farming is largely carried on. The manufactures are on a small scale, and include agricultural implements, Witney blankets, paper, and gloves. Capital, Oxford. Population of county, in 1891, 185,669; in 1901, 182,800.

OXFORD UNIVERSITY. One of the two principal universities of England. The legendary stories of its foundation by King Alfred may be neglected; but as early as 1117 there are notices of Continental scholars lecturing at Oxford, possibly attracted by the neighborhood of the palace of the scholar King, Henry I. The expulsion of foreigners from the University of Paris, as one of the results of the quarrel between Henry II. and Becket, seems to have caused a definite immigration to Oxford; and the account of a visit paid to it by Giraldus Cambrensis about 1185 shows that it was already a centre of learning, and possessed organized faculties with regular degrees. From this time on the university is a place of importance. In the reign of Richard I. scholars were maintained there by the royal bounty; and in 1209 the academic community suffered, as it had earlier grown, by migration. This grew out of one of the frequent conflicts between students and townspeople, and had as a result the transfer of a considerable number of students to Cambridge and the rise of the schools there to the dignity of a *Studium Generale*. In 1214 the liberties of the university were confirmed by decision of a Papal legate, which names for the first time a chancellor as a representative of the university, and requires the townsmen to surrender to him or to some other representative of the Bishop any 'clerks' whom they had seized. The distance from the see city of the diocese, Lincoln, which minimized direct episcopal control, and the prolonged struggles between town and gown, in which the university was generally successful, helped to differentiate it from the Continental universities. Yet in many ways the organization of Oxford was like that of Paris, a self-governing guild of masters, presided over by a chancellor of their election. As elsewhere, the earliest organization was for the purpose of limitation, not extension, of teaching; it was a trade guild, intended to supervise the qualifications of those who claimed admission to the teaching body. Like Paris and its imitators, Oxford had its 'nations,' though here there were but two—the North, including the Scotch, and the South, including the Welsh and Irish. From the beginning, the faculty of arts was of chief importance, those of law, medicine, and theology never rising to the dignity of separate deans. In the management of university affairs, the congregation or assembly of 'regents,' masters actually engaged in instruction, passed upon measures before they were submitted to the greater congregation or whole body of masters. It was a democratic society, and was found on the side of independence against Henry III., who threatened such radical measures as the hanging of the whole body of students. The reform movement of Wiclif, himself a fellow and perhaps a master of a college, also found here a considerable body of sympathizers. The mention of colleges brings us to an important step in the development of the university. At first, as elsewhere, the students had lived independently at their own expense in the town. By degrees voluntary associations of students sprang up, which elected their head, rented a house, obtained a license from the university, and acquired something like a corporate existence. By the middle of the thirteenth century, too, the mendicant Orders had begun to plant themselves in Oxford, as they were doing in other universities. The Dominicans came in 1221, the Franciscans in 1224, the Carmelites in 1256, and the Augustinians in 1268. They acquired property, built houses, and gained an influence among the students which soon brought them into conflict with the university authorities.

But about the same time another movement was set on foot which was destined to have more lasting consequences. This was the establishment of colleges by private benefaction for the support of students, combining the freedom of the halls with the means of support offered by the religious houses. The movement seems to have begun in Oxford and Paris almost simultaneously. In 1249 William of Durham left three hundred and ten marks for the support of ten masters in lodgings, which were purchased by the university in 1253; this endowment grew in 1280 by the granting of definite statutes unto the oldest of the colleges, University College. Sir John de Baliol, between 1261 and 1266, laid the foundation of Balliol College by a similar gift; but the real type, which was afterwards to prevail, was struck out by Walter de Merton, who founded and gave his name to the first real college in the modern sense at Oxford. It was not, like the colleges at Paris, an association of masters of arts electing their own head, but without control of the funds by which they were supported; it was governed by a warden and a number of senior fellows, who perpetuated their own body by cooptation, administered their own property, and oversaw the younger members of the college. Thus a fourth class of students came into being, besides the 'chamberdekyns,' who lived in independent lodgings in the town, those who were inmates of religious houses, and those who lived in hostels or halls. With the foundation of colleges, often by the absorption of these older halls, came a corresponding diminution in the number of the latter, and they are now almost extinct. The tendency was toward the inclusion of all students in colleges, where discipline as well as instruction would be easier.

The fourteenth century saw the foundation of a number of these. Exeter College (1314), Oriel (1324), Queen's (1340), and New College (1379), show the importance of the movement in this century. The exhaustion of England and its demoralized condition, growing out of the Hundred

Years' War and the Wars of the Roses, is revealed in the fact that only three colleges were founded in the fifteenth century—Lincoln (1427), All Souls (1437), and Magdalen (1458), in which last the system of teaching within college walls, begun by William of Wykeham at New College, was carried much further. The next century is much more prolific. Its foundations include Brasenose (1509), Corpus Christi (1516), Christ Church (planned by Wolsey as Cardinal College, but dating in its present form from Henry VIII.'s remodeling in 1546, and including the older Canterbury College), Trinity (1555), Saint John's (1555), and Jesus (1571). There are only two in the seventeenth century—Wadham (1612) and Pembroke (1624); then almost a century passes before the transformation of Gloucester Hall into Worcester College in 1714. Keble College (1870), and Hertford in its present condition (1874, though after a checkered career, lasting from 1282), date from the nineteenth. These, with the two remaining halls, Saint Mary and Saint Edmund, both doomed to extinction, like New Inn Hall, which has been absorbed into Balliol, a large body of non-collegiate students, and three small private halls, include all the resident members of the university. The foundation of the colleges had a profound influence on the history and polity of the university, and their existence here and at Cambridge marks the difference between these and other universities.

To return to the general history: The new learning of the Renaissance was at first warmly received at Oxford, and all the earliest Greek students in England were Oxford men. The more conservative members of the university, known as 'Trojans' from the opposition to the Grecians, resisted it for a time as likely to lead to heresy. The violent changes of the Reformation affected the prosperity of Oxford unfavorably. Elizabeth, however, did much to restore it, and Archbishop Laud, who was the ruling spirit there in the first half of the seventeenth century, still more. During the Civil War Oxford was more a court and a fortress than a home of study. The King resided at Christ Church, the Queen at Corpus Christi, and Parliament was held in the Divinity Schools. The university loyally contributed all its plate to the cause, and remained for long afterwards strongly reactionary in its politics. Yet the attempt of James II. to force a Roman Catholic head upon Magdalen was vigorously resisted, and was one of the causes which contributed to his overthrow. The eighteenth century was a period of stagnation; its only striking event was the rise of the Methodists from Oxford to influence the spiritual life of the nation, as the Tractarians (see OXFORD MOVEMENT) did half a century later. The history of the nineteenth century has been one of change. Two royal commissions have examined the whole subject of the university system; and legislation in 1850, 1876, and 1882 especially has resulted in freeing both university and colleges from the restrictions of the mediæval statutes, in restoring the university professoriate, in opening the fellowships to merit, and in relaxing the religious tests.

The constitution of the university may be most easily explained by drawing an analogy with that of the United States. It is strictly a federation, in which the colleges, with their own complete internal organization and laws, answer to the several States, while the university, with its separate officials and legislative bodies, represents the national Government. Its nominal head is the chancellor, who, however, 'reigns but does not govern.' He is usually some great nobleman or officer of State; thus the Marquis of Salisbury has held the office for many years. The actual administrative functions are discharged by the vice-chancellor, who is always the head of a college, elected for a period of four years in rotation. He is a dignified official, preceded in his public appearances by mace-bearers or beadles, and still invested with many far-reaching powers; in his court all cases are tried which affect members of the university. The disciplinary functions of the university are in the hands of the proctors —two masters of arts elected annually by the colleges in turn. Their powers are also extensive, a survival of mediæval days, and extend in some particulars even over those who are not members of the university, but whom they may, for cause, forbid to reside in the town. Their surveillance, while of course it is always directed to the prevention or punishment of serious breaches of morality or order, is exercised in such minor details as the infraction of the rule which forbids an undergraduate to appear in the streets after dinner without cap and gown.

Legislative proposals are first brought up in the Hebdomadal Council, a body mainly of practical educators, composed of the vice-chancellor, the retiring vice-chancellor, the proctors, and eighteen members elected by Congregation, of whom six must be heads of colleges, six professors, and six members of Convocation of five years' standing. This body, which, as its name implies, meets weekly, initiates legislation by framing statutes and presenting them to Congregation. The latter consists, besides certain ex-officio members, of all masters and doctors who reside in Oxford one hundred and forty days in each year—some four or five hundred in all. Statutes approved by Congregation are presented to Convocation, which may adopt or reject but cannot amend them. This larger body is composed of all masters and doctors who have kept their names on the books of their colleges, no matter where residing. The number amounts to some six or seven thousand; but no large proportion of these attend except on the occasion of some burning question of theological or academic import, when stirring scenes sometimes take place. Convocation, most of whose routine business is intrusted to certain committees called delegacies, also elects the two members of Parliament whom the university has returned since the reign of James I.

The examinations are conducted and the degrees granted by the university, not by the colleges. The examinations for the degree of B. A. are three in number. The first, responsions, colloquially 'smalls,' is now in practice usually taken at or before matriculation. The second, moderations ('mods'), occurs after one or two years, according to whether the candidate seeks honors in it or not; and two years later comes the final examination, or 'greats.' The degree of M. A. requires no further examination, but may be taken by any B. A. of twenty-seven terms standing (about seven years) from matriculation. In law, theology, science, music, letters, and medicine, there are various complicated requirements, including an examination or its equivalent, for

the bachelor's and doctor's degrees, except in the rare cases where they are honorary. Until recent years Oxford maintained rather strictly the traditional ideal of a classical education, contrasted with Cambridge, which has always excelled more in mathematical and scientific lines; but a strong tendency has been shown of late, and deeply deplored by the more conservative, to reduce the quantity of Latin and Greek required to a minimum. In moderations and finals, each 'school' or department is divided into a pass and an honor school, differing in the amount and quality of the work and the difficulty of the examinations. The degree attained is the same in each case; but in the honor schools lists of the men, divided into four classes (three in moderations), have been published since the establishment of this system in 1801.

The internal organization of each college consists of a head (variously called warden, provost, principal, president, or master), and of a number of fellows and tutors—the tutorial office being sometimes combined with a fellowship and sometimes separate from it. The officer charged with the internal discipline is known as the dean, except at Christ Church, where the dean is head both of the college and of the cathedral of the diocese of Oxford, which is combined with it. All these are known collectively and colloquially as 'the Dons.' To each undergraduate on his matriculation is assigned a particular tutor, who is supposed to take a close personal interest in him, in fact to stand *in loco parentis* during his residence; a man's own tutor, however, need not have anything directly to do with his studies, unless he happens to take up the branch in which the tutor gives instruction. Formal teaching is chiefly by means of lectures, which are supplied usually by the college or by combinations of colleges. The exception is the lectures of the professors, who are university functionaries and whose lectures are public. At these lectures, of which two, three, or four may be attended in a morning, the undergraduate is supposed to take full notes to which he may refer afterwards. Except an occasional request to construe a passage of a Latin or Greek author in a man's first year, there is scarcely any approach to what are known in America as recitations. The instruction given in the lectures is supplemented by individual instruction given by the tutors of the college, especially by means of essays, which the student writes on his subject and the tutor corrects. Beyond this, a man is supposed to 'read' for some hours each day, at his own discretion. This freedom is a characteristic feature of the Oxford and Cambridge system. It is tempered by a college examination known as 'collections' at the end of each term; this has no effect on the obtaining of a degree, but is intended simply to give the college authorities an idea of how a man's work is progressing.

The afternoon is devoted by most undergraduates to athletic exercise of one sort or another, interest in which forms a normal part of the life. Distinctions won in this way—the right to wear the 'blue,' the university color which denotes that the wearer has represented the university in cricket, football, rowing, etc.—are as eagerly coveted as a 'double first' in the schools. In the evening the whole college assembles in the hall for dinner, the dons sitting at the 'high table' on a sort of dais. Breakfast and lunch are taken in a man's own sitting-room. The evening is spent as he pleases, except that if he is residing in college he is absolutely required to be within the college gates before midnight. If he does not intend to 'read,' he will pass the evening in visiting or entertaining his friends, or in attending the meetings of the innumerable societies which exist, devoted to every conceivable interest, literary, scientific, musical, or purely social. Of these the most famous is the Union Society, which combines all the conveniences of a London club with the holding of regular debates in which many of the most famous public orators of England, from Mr. Gladstone and Lord Salisbury down, have received their first training. In fact, it may be considered one of the essential characteristics of English university life that there is no strict line of demarcation drawn between it and the after career of the student. The elasticity of the system adapts it to the requirements of very varied types of men; and the undergraduate who expects to enter political life or to become a mere country gentleman may profit by the discipline of life and the atmosphere of general culture, while a man who seeks for the attainment of advanced scholarship can easily get all the help he needs. The existence side by side of the pass and honor schools constitutes a distinct disavowal of the system of Procrustes.

The prevalent religious tone of the university is still one of attachment to the Church of England, in spite of the relaxation of the strict requirements of past days. The services in the college chapels are those of the Prayer-Book; attendance on them a certain number of times in each week is still usually compulsory, though in some colleges a roll-call at an early hour in the morning is allowed to take the place of the prayers. Since the throwing open of the university, Mansfield College for Congregationalists and Manchester College for Independents have been founded, as well as more recently a hall for Roman Catholic students. None of these, however, have any corporate connection with the university. Other institutions which have an influence upon the spiritual life of undergraduates are the Pusey House (see PUSEY) and Saint Stephen's House, the latter intended primarily as a training school for Church of England missionaries. Outside of the colleges proper there is also a considerable body of unattached students, who are members of the university without belonging to any college or hall. They are under the general supervision of an official known as the censor of unattached students. This class was admitted first in 1858. The total number of undergraduates is generally over three thousand. Since 1884 women have been allowed to share the instruction, though not to matriculate or take degrees. Two houses, Somerville and Lady Margaret Halls, have been founded for them.

BIBLIOGRAPHY. For detailed official information, consult the annual *University Calendar;* also the *Student's Handbook to the University of Oxford.* For historical and descriptive treatment, Brodrick, *History of Oxford University* (London, 1886); Wells, *Oxford and Its Colleges* (ib., 1899); Clark, *The Colleges of Oxford* (ib., 1891); Andrew Lang, *Oxford* (ib., 1879); Goldwin Smith, *Oxford and Her Colleges* (ib., 1895); Rashdall, *History of Universities in the Middle Ages* (Oxford, 1895). For fictitious description,

while Hughes's *Tom Brown at Oxford* (Cambridge, 1861) gives a pretty accurate picture of those days, the best modern presentation of the life and spirit of the place has been given by an American, L. P. Smith, in *The Youth of Parnassus* (London, 1895). See also OXFORD, and the articles on the separate colleges.

OX-GALL. The bile of the ox, greenish-yellow in color. It has several uses in the arts and manufactures. It is an excellent cleansing agent on account of the abundance of soda in its composition, which gives it a soapy quality, and is used for scouring wool and other purposes. It is reduced to the form of an extract for preservation, and is dissolved in alkaline water for use. Its chief employment is in mixing colors, especially in water-color painting, the effect being to give them tenacity and fluidity. It is also an ingredient in varnish and is a substitute for India ink, and is used in painting on ivory.

OX'IA'NA, LAKE OF. The ancient name of a lake in Asia. See ARAL.

OX'IDASE (from Gk. ὀξύς, *oxys*, sharp, quick, acid). The name of a group of inadequately known enzymes (q.v.), producing direct oxidation of various substances, particularly coloring matters and sugars. Oxidases appear to be widely distributed among plants, having been found in many fungi, in the latex (milky or colored sap) of certain plants, and in many kinds of leaves and fruits. Probably they will be found to play an important rôle both as agents in normal functions and as the cause of disease. The destruction of chlorophyll in certain areas of leaves, as, for example, in tobacco ('mosaic' disease), has been ascribed to the action of oxidizing enzymes upon the green pigment.

OXIDES (from Gk. ὀξύς, *oxys*, sharp, quick, acid). A term applied to a variety of compounds of oxygen, but more especially to those in which oxygen is combined only with a metal or a metalloid. The principal classes of oxides are the basic or metallic oxides, and the acid oxides or acid anhydrides. Lime, the oxide of calcium, is an example of oxides of the first class. Sulphur trioxide, or sulphuric anhydride (SO_3), is an example of oxides of the second class. An oxide of one class as a rule combines readily with an oxide of the second class to form a salt. Thus lime combines with sulphur trioxide to form calcium sulphate. Oxides are frequently prepared by the direct union of oxygen with other elements. Thus the oxides of all the elements, except bromine, chlorine, fluorine, iodine, gold, and platinum (not to mention the inert elements argon, helium, etc.), may be prepared. Many of the metallic oxides are formed by the action of heat on carbonates, nitrates, and other salts of volatilizable acids. Thus chalk (calcium carbonate) is transformed by heat into lime. The metallic oxides occurring in nature are among the most abundant and valuable ores. Thus hematite (sesquioxide of iron), pyrolusite (manganese dioxide), and cassiterite (tin dioxide) are important ores, respectively, of iron, manganese, and tin.

OX'LEY, JAMES MACDONALD (1855—). A Canadian author, born at Halifax, Nova Scotia, October 22, 1855. He graduated B.A. from Dalhousie University in 1874, and subsequently studied at Harvard. Called to the bar in 1878, he practiced in his native city for five years and then became legal adviser to the Department of Marine and Fisheries at Ottawa. During this period he edited *Nova Scotia Decisions* (1880-83) and Young's *Admiralty Decisions* (1882). He resigned his position in 1891, and in 1892 he became manager of the Sun Life Assurance Company at Montreal. Before leaving Ottawa, Oxley had begun his long series of books for boys, among which are *Bert Lloyd's Boyhood* (1887); *Up Among the Ice Floes* (1890); *The Chore Boy of Camp Kippewa* (1891); *Donald Grant's Development* (1892); *Diamond Rock* (1893); *Archie McKenzie, the Young Nor'wester* (1894); *In the Wilds of the West Coast* (1894); *On the World's Roof* (1896); *In the Swing of the Sea* (1897); *Fife and Drum at Louisbourg* (1899); and *Lhasa at Last*, a journey to the Forbidden City of Tibet (1900).

OXLEYA (Neo-Lat., named in honor of John *Oxley*, an Australian explorer in the nineteenth century), or FLINDERSIA. A genus of trees of the natural order Cedrelaceæ, of which one species, *Flindersia Oxleyana*, the yellow wood of Eastern Australia, often attains a height of 100 feet. Its timber is valued for boat-building, for cabinet-work, and for other purposes where an ornamental wood is desired. It is quite resistant to attacks of ants, an important consideration in tropical countries. A yellow dye is obtained from the tree. See FLINDERSIA.

OXLIP. An ornamental plant. See PRIMULA.

OXPECKER, or BUFFALO-BIRD. Any of several starlings, or starling-like birds, which gather about cattle and pick the parasites from their hides, or feed upon the insects which they disturb in the grass. The name more especially belongs to a South African species (*Buphaga Africana*), which seeks the company of the wild buffalo, and nowadays of tame cattle, and picks the ticks from their hides. Another species (*Buphaga erythrorhyncha*), distinguished by its red bill, performs the same service for the rhinoceros, and is commonly called 'rhinoceros-bird.' Similar birds with similar habits are known in the Orient as 'buffalo-birds,' and belong to the large genus Sturnopastor. Similar habits belong to the American cowbirds (q.v.). Compare BUFFALO-BIRD; and see Plate of LARKS AND STARLINGS.

OX'US. The ancient name of the Amu (q.v.).

OX-WARBLE. See BOT; WARBLE-FLY.

OXY-ACIDS. Those acids which contain oxygen, as distinguished from the acids which do not contain oxygen and were formerly designated as *hydracids*. The term oxy-acids is now seldom used in this sense. On the other hand, the term oxy-acids, or preferably *hydroxy-acids*, is applied by organic chemists to carbon compounds that are at once acids and alcohols, i.e. acids whose molecules contain one or more hydroxyl groups (OH) attached to a hydrocarbon radicle. (See ALCOHOLS.) Thus oxy-acetic acid, or hydroxy-acetic acid, known as 'glycollic acid,' has the constitutional formula $CH_2(OH).COOH$.

OX'YÆ'NA (Neo-Lat., from Gk. ὀξύς, *oxys*, sharp, quick, acid). A fossil creodont mammal

from the Wasatch Lower Eocene beds of the Western United States. See PATRIOFELIS.

OXYGEN (from Gk. ὀξύς, *oxys*, sharp, quick, acid + *-γενής*, *-genēs*, producing, from *γίγνεσθαι*, *gignesthai*, to become). A gaseous element isolated by Priestley in 1774. Priestley's classical researches in pneumatic chemistry led him to the discovery that when red mercuric oxide is heated by the sun's rays it decomposes into a colorless gas, which he called 'dephlogisticated air,' and metallic mercury. A year later Scheele, in Sweden, independently discovered oxygen, giving it the name of 'empyreal air.' Shortly afterwards Condorcet suggested the name of 'vital air.' Lavoisier, however, was the first definitely to establish the true character of oxygen, and it was he who first gave it its present name. See CHEMISTRY.

Oxygen exists uncombined in the atmosphere, to the extent of 21 per cent. by volume and more than 23 per cent. by weight. In combination, too, it is very abundant in nature, forming eight-ninths by weight of all water and a considerable percentage by weight of silica, alumina, and chalk, which are the three most abundant and widely distributed constituents of the earth's crust. It is further a normal component of nearly every rock and mineral, and of all animal and vegetable tissues and fluids. It is absorbed in large quantities from the atmosphere by animals and vegetables in the process of respiration, but plants also evolve it under the influence of sunlight. Oxygen may be readily prepared by heating red mercuric oxide, by heating manganese dioxide to a red heat, or by heating potassium chlorate to 370° C. Commercially it was long made by heating manganese dioxide, either alone or together with potassium chlorate. The alternate formation and decomposition of alkaline manganates was originally proposed in 1866 by Tessie du Motay, as a process of manufacturing oxygen for illuminating purposes. The process has been successfully employed in Europe and the United States. But more recently the alternate formation and decomposition of barium peroxide has been taken advantage of for the commercial production of oxygen. This method, which was chiefly developed by the brothers Brin, consists in heating barium oxide to a dull red heat in a current of air, whereby it is converted into barium peroxide, which at a still greater heat is decomposed again into barium oxide and free oxygen. This economic process is being worked on a large scale in various places. Pictet, in 1901, announced the invention of an economical method for obtaining oxygen from the air.

Oxygen (symbol, O; atomic weight, 16; see ATOMIC WEIGHTS) is a colorless, odorless, and tasteless gas which has been condensed to a pale steel-blue, transparent liquid, boiling at —181.4° C. and freezing to a white solid at —235° C. Compared with air as unity, oxygen has a specific gravity of 1.1504, and it is the least refractive of all gases. Oxygen is slightly magnetic, which property is diminished or temporarily suspended by elevation of temperature. When examined through thick layers, oxygen has a bluish tinge of color. It combines directly with most of the elements. (See OXIDES.) It is sparingly soluble in water, and nearly all natural waters contain oxygen in solution which can be completely removed by boiling in vacuo. This dissolved oxygen is the source from which fish obtain the oxygen necessary to sustain life. In the pure state it may be inhaled, for a time, with impunity, and it even acts as a tonic or exhilarant. Its long-continued respiration, however, is harmful. In pure oxygen bodies burn with much greater brilliancy than in common air. See COMBUSTION.

Oxygen has been used successfully to maintain air in a respirable condition, as in diving bells, submarine vessels, etc., and its use has been suggested for the revivifying of the atmosphere in public halls. It finds extensive application, in connection with hydrogen or illuminating gas, to produce the oxyhydrogen flame. (See OXYHYDROGEN BLOWPIPE and DRUMMOND LIGHT.) It is also used in the bleaching of paper pulp, in the oxidation and thickening of oils which are used in the manufacture of varnish and oilcloths, for the purpose of hastening the maturing of spirits, or liquors, and in the manufacture of vinegar. See also OZONE.

OXYGEN, IN MEDICINE. Oxygen is widely used, both in medical and surgical practice, in three ways: By the inhalation of the gas itself, by drinking oxygenated water, and by means of peroxide of hydrogen.

When employed as a gas, oxygen is liberated slowly from a cylinder containing it under strong pressure, and inhaled. In this form it is given in all conditions where there is interference with respiration. In the later stages of pneumonia, when there is danger to life from deficient aeration of the blood; in the chronic bronchitis of old people; and for the resuscitation of victims of coal-gas asphyxiation, oxygen gas is of very great value. It will allay the oppression and dyspnœa in phthisis and other wasting diseases. It acts as a direct stimulant to the respiratory mucous membrane, and has a beneficial effect on the heart and respiration. When prolonged anæsthesia is necessary, oxygen is often given in conjunction with the general anæsthetics, to relieve cyanosis, and as a safeguard against cardiac or respiratory failure. The use of oxygen in medicine is due to the valuable opinions and demonstrations of Dr. A. H. Smith, of New York.

OXYGENATED WATER is a solution of the gas in distilled water, made under pressure, and drawn off by means of a tap such as is used in siphons. It is taken internally, a glassful at a dose, and has a distinct value in chronic dyspepsia, persistent vomiting, constipation, and in headaches, whether neuralgic or digestive.

PEROXIDE OF HYDROGEN is a powerful local antiseptic, possessing the property of effervescing in the presence of pus, which it is useful in detecting in doubtful cases. It is widely used in diphtheria to loosen and destroy the false membrane. Application is made by means of a swab or spray. It is much used to cleanse ulcers and wash out abscess cavities. See HYDROGEN DIOXIDE.

OXYHYDROGEN BLOWPIPE, or COMPOUND BLOWPIPE. An apparatus by means of which hydrogen is burned in pure oxygen, the flame having an exceedingly high temperature. This apparatus, invented by Dr. Robert Hare, of Philadelphia, in 1801, and originally called a 'hydrostatic blowpipe,' may be used for fusing highly refractory substances. According to Bunsen, a temperature of 2844° C. (5151° F.) is obtained when a jet of oxygen gas is brought within the flame of hydrogen gas. A watch spring held

in such a flame, which is almost colorless, burns with brilliant scintillations, and platinum can be fused by means of the flame. The principal use of the oxyhydrogen flame has been for fusing metals, although recently similar results have been obtained by the electric furnace. See DRUMMOND LIGHT.

OX'YTO'CICS (from Gk. *ὀξυτόκιον*, *oxytokion*, medicine to facilitate quick delivery, from *ὀξύς*, *oxys*, sharp, quick, acid + *τόκος*, *tokos*, birth). Remedies which increase uterine contractions. The chief drugs of this class are ergot (q.v.) and quinine (q.v.). Ergot is the most widely known and used oxytocic, and was formerly employed to hasten labor, but it is now known that this practice is extremely dangerous, as it causes a tetanic instead of an intermittent contraction of the wall of the uterus and may lead to its rupture, an accident often fatal. It should never be given until the uterus has been emptied. In this way it is frequently given after labor, to cause contraction of the uterus and so prevent hemorrhage.

OX'YURIS (Neo-Lat., from Gk. *ὀξύς*, *oxys*, sharp, quick, acid + *ὀυρά*, *oura*, tail). A nematode worm belonging to the Ascaridæ, characterized by a fusiform shape and a rounded oval aperture. The variety *vermicularis* is the thread-worm or maw-worm found in the sigmoid flexure and in the rectum of human beings. In horses this worm is called the bot. The male is ¼ inch, the female nearly ½ inch in length. See ANTHELMINTIC.

OYER, ō'yėr (A.F., to hear). A term employed in common-law pleading to signify a demand by one party to an action, to hear read, or to have produced for inspection, a document to which the other party refers in his pleadings. Originally where a party based his claim or defense upon a deed, letters testamentary, or letters of administration, he was obliged to 'make profert' of the instrument, that is, allege that he produced it in court, whereupon the other party might 'crave oyer,' that is, demand to hear it read, in order that he might avail himself of its contents in his pleadings if he deemed it advisable. At a later date, instead of having it actually read in open court and spreading it upon the records, the party making profert was required to give the opposite party a true copy of the instrument.

In England and most of the United States the practice of requiring a pleader to make profert has been abolished, and with it the practice of demanding oyer, and instead a party referring to an instrument in a pleading is required to annex a true copy thereto. If it becomes necessary for a party to inspect a document in the hands of the other, he obtains an order to that effect from the court. See EVIDENCE.

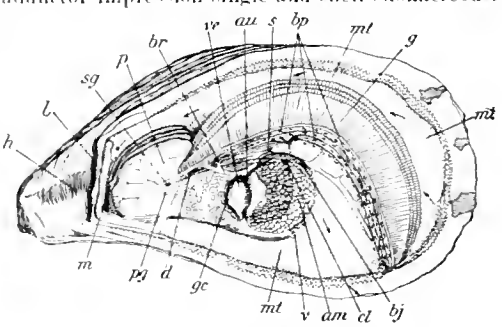
OYER AND TER'MINER (AF., to hear and to determine). In English law, a commission under the King's great seal appointing certain judges to hear and determine criminal causes in and for designated circuits. This commission was very ancient in its origin, it having first been employed some time after the reign of Edward III., the exact date not being certain. Before the Judicature Act (q.v.), the commissioners, as the judges so appointed were called, constituted the Court of Oyer and Terminer. The above act vested in the High Court of Justice all the powers formerly exercised by the Court of Oyer and Terminer, but its jurisdiction of criminal offenses is still dependent upon such a commission. A special commission is sometimes issued, authorizing the judges to try certain designated criminal cases out of the regular term.

The highest court of criminal jurisdiction in the State of New York was formerly known as the Court of Oyer and Terminer, but it derived its jurisdiction from the statutes creating it and not from a commission as was the case in England. It has been merged in the Supreme Court by the Constitution.

OYEZ, ō'yez (AF., OF., hear ye). An introductory word sometimes employed by court officers or criers in announcing the opening of court. It was introduced into England by the Normans, together with their other legal expressions and forms. The English translation 'hear ye' is still employed by most court criers in the United States.

OYO, ō'yō. The capital of the African State of Yoruba, now included in British Nigeria, situated about 90 miles northeast of Abeokuta (Map: Africa, E 4). It has an estimated population of 60,000, and its inhabitants are said to be intelligent and skillful in the crafts.

OYSTER (OF. *oistre*, *ouistre*, *huistre*, Fr. *huître*, from Lat. *ostrea*, *ostreum*, from Gk. *ὄστρεον*, oyster; connected with *ὀστέον*, *osteon*, Lat. *os*, bone). A sessile bivalve mollusk of the family Ostreidæ, especially any of the numerous species, extinct and extant, of the genus Ostrea. The shells are irregular and unequal; the fixed left valve generally spacious, strongly convex without and excavated within; right valve generally plane or concave externally, always less convex than its fellow; both shells beaked; ligamental area elongate or triangular; hinge toothless; adductor impression single and shell submacreous.



ANATOMY OF OSTREA VIRGINICA.

h, Hinge; *l*, ligament; *d*, *pg*, and *sq*, connective, and two ganglia of the nervous system; *p*, palps; *br*, blood-vessel from gills to auricle of heart; *au*, auricle; *ve*, ventricle; *s*, external opening of sexual and renal organs of right side; *bp*, pores from which the water issues into the branchial canals after passing through the gills; *mt*, mantle (the arrows showing the direction of currents produced by cilia); *g*, gills; *gc*, cavity between the two mantle folds; *cl*, cloaca; *am*, adductor muscle (cut across); *bj*, outline of organ of Bojanus, the so-called 'kidney.'

The oyster of the eastern coast of the United States is *Ostrea Virginica*, a valuable species of protean characters, formerly much subdivided by systematists and almost impossible to diagnose. The shells are lateral and hinged anteriorly, an elastic pad (ligament) causing them normally to gape. Closely applied to their inner faces and extensible beyond their margins are two thin folds (mantle) of the body-wall, which secrete the

shell in successive layers within and on the margins. The mantle encloses a chamber (mantle cavity) open ventrally and posteriorly, into which project on each side a pair of gills, commonly called the 'beard,' and in front of these a pair of smaller fleshy lobes (palps). Above the gills and palps lies the body, containing the digestive, reproductive, circulatory, excretory, and nervous systems, and the adductor muscle which closes the shells. The adductor (popularly, the 'eye' or 'heart') lies somewhat behind the middle of the body, the dark scars on the inside of empty shells marking its attachments. The funnel-shaped mouth lies between the two pairs of palps. A short gullet leads into a spacious stomach, and this into the tubular intestine which opens by an anus above the adductor. Surrounding the stomach is the liver, a large dark green digestive gland opening into the stomach by numerous ducts. In front of the adductor lies the pericardium, containing the two-chambered heart and in proximity to the excretory organ. The simple degenerate nervous system consists of two pairs of ganglia, one above the gullet and the other beneath the adductor, connected by a pair of nerve cords.

The sexes are separate, but without external distinction. The sexual glands when ripe are creamy white organs surrounding the digestive system and opening on each side beneath the adductor. In Long Island Sound spawning occurs from May to August, in Chesapeake Bay from April to October, in South Carolina as early as March, and in Florida as early as February. In oysters transplanted during the spawning season reproduction is often interfered with or arrested. An average oyster will produce 16,000,000 eggs and a very large one 60,000,000. When ripe the sexual products ooze from the genital openings and fertilization results from their accidental meeting in the water. Segmentation results in five or six hours in the production of a ciliated gastrula, a cup-shaped, free-swimming organism, often carried by the currents to found new and remote beds. An embryonic shell soon appears, and the little oyster sinks to the bottom, where, if favorably situated, it becomes attached by its left valve and gradually assumes the adult form. The recently attached spat is 1-80 to 1-90 of an inch in diameter, and its subsequent growth varies with its environment. Single oysters on firm bottom become round and deep, but those in clusters or on soft bottom grow irregular and elongate. On undisturbed natural beds they grow in clusters, and the beds repose, as a rule, on a muddy substratum upon which they have been built up from a comparatively small nucleus by the fixation, year after year, of the young upon the shells of their predecessors.

Oysters live from above low-water mark to a depth of 15 fathoms, where the density is between 1.002 and 1.025, the optimum being from 1.011 to 1.022, and in a range of temperature which in Chesapeake Bay extends from 32° F. to 90° F. The embryos and fry require more equable and stable conditions, the temperature required being between 68° F. and 80° F. The best and most productive beds are commonly in strong tidal currents, which disseminate the fry and food and keep the old shells clean enough to catch the spat. Diatoms constitute about 90 per cent. of the oyster's food, the rest consisting of other small plants and animals, and in the breeding season of its own eggs and fry. The latter are eaten by other mollusca also, and from its attachment until it reaches a large size the oyster is preyed upon by starfish, drills (Urosalpinx), drumfish, rays, and other aggressive enemies, while it wages a passive fight against starvation and suffocation with mussels, barnacles, sponges, worms, aquatic vegetation, and other prolific or luxuriant organisms growing on the beds.

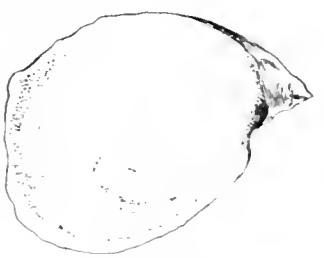
Ostrea Virginica occurs from the Gulf of Saint Lawrence to the tropics, but between Cape Breton and Cape Cod the Sheepscot River, Maine, is its only locality. It has also been introduced in San Francisco Bay, where it breeds to a limited extent. The yield of Eastern oysters at the beginning of the present century was as follows:

	Bushels	Value*
Gulf States	1,087,226	$687,539
South Atlantic States	1,612,181	884,934
Middle Atlantic States	19,749,077	10,286,556
New England States	2,649,072	1,910,684
Pacific States	360,000	792,000
Canada (estimated)	95,000	150,000
Totals	26,453,146	$14,211,713

* Value to oystermen and growers.

The greatest production is in Chesapeake Bay, where the principal yield is from the natural beds. Most of the oysters from New England and from New York and the outer coast of New Jersey are produced by planted beds; the entire yield of the Pacific Coast is similarly derived, and there has been recently a considerable increase in oyster culture in New Jersey, Virginia, and other States. The number of persons engaged in the industry is estimated at upward of 60,000, but as many of them are employed part of the year in other fisheries, farming, etc., definite statistics are not available. Baltimore is the most extensive market and New York has a considerable export trade with Europe.

The native oyster of the Pacific Coast is *Ostrea lurida*, a small thin-shelled species. It is hermaphroditic, and, like the European oyster, retains its young for a time in the mantle cavity. In 1901 159,340 bushels, valued at $251,192, were marketed, principally on the Pacific Coast.



PACIFIC COAST OYSTER

The European oyster (*Ostrea edulis*) is found from Italy to Norway. It is a round thin-shelled species, more shapely than the American species, and hermaphroditic, first female and afterwards male. It is less prolific than its American relative and the young undergo considerable development in the mantle chamber of the mother. It thrives in water of full, or almost full, organic density. The Portuguese oyster (*Ostrea angulata*) sexually and in its habits more closely resembles *Ostrea Virginica*.

The oysters of Japan are *Ostrea cucullata*, which occurs in shallow and moderately brackish or moderately salt water throughout the whole archipelago; and *Ostrea gigas*, a very large salt water species found in deep water. Many other species of Ostrea are found in temperate and tropical seas throughout the world.

Fossil Oysters. The oyster family appears to have had its origin in some imperfectly known forms, such as *Ostrea nobilissima* of the Carboniferous. The family is found also in the Permian. In the Triassic it is represented by a strongly plicated form, Aleetryonia, which form becomes more prominent in the Jurassic and Cretaceous. There are also the common arcuate shells of Gryphæa and Exogyra in the Jurassic and Cretaceous. Ostrea itself is known in the Mesozoic, but it attained its maximum of size and abundance in the Tertiary. The sandy marls of this period in the Southeastern United States often contain great numbers of very large specimens of oysters, especially of two species, *Ostrea Georgiana* and *Ostrea sellæformis*. Consult White, C. A., "A Review of the Fossil Ostreidæ of North America and a Comparison of the Fossil with the Living Forms," *Annual Report of the United States Geological Survey*, vol. iv. (Washington, 1883).

Oyster Culture. Owing to the exhaustion of the natural beds and their inability to supply the demand for oysters, it has been found necessary to resort to artificial methods of production, effecting (1) an increase in the number of eggs fertilized; (2) an increase in the surfaces available for fixation, and also of the number of spat attaching; (3) the saving of spat and young oysters which would naturally fall victims to enemies and adverse physical conditions; and (4) the utilization of barren bottoms and naturally unavailable food supplies. But a small part of the area under water suitable for oysters has been utilized by nature, mainly for lack of suitable bodies for the attachment of the young. In the United States such barren bottom is utilized by clearing it of all rubbish and either planting 'cultch' to collect the spat, or else young oysters (seed), that they may improve in size, shape, and quality under conditions safer and more favorable than in their original environment. In certain places either method may succeed, but commonly a locality is better adapted to one than the other.

The most suitable bottom for oyster culture consists of firm mud or of a firm substratum with a thin surface of soft mud, but stable sandy bottom is often used with success. Rocky bottom is usually deficient in food, loose sand drifts and covers the oysters, and very soft mud ingulfs and stifles them or produces inferior elongate stock. Mud naturally too soft may be utilized by distributing over it shells, sand, or other material, which, resting on or near the surface, furnishes a firm foundation upon which the growing oyster may repose in security. For spat-collecting it is frequently advantageous to use hard mud, gravel, or rocky bottom in shoal water, ill adapted to adult oysters from deficiency of food. The bottom being properly prepared and its boundaries marked with stakes or buoys, either system may be adopted to accord with circumstances. Generally seed-planting is more certain in its results and yields quicker returns to the grower. Seed-oysters vary from 'blisters' ½ inch in diameter to individuals almost ready for market, but ordinarily they are between 1 and 3 inches long. They are obtained from planters making a specialty of seed production or from natural beds, their cost varying from 10 cents to $1 per bushel, the larger culled stock, separate, well shaped, and free from rubbish, bringing higher prices and giving the best results. From 300 to 600 bushels of culled seed per acre are used, a larger quantity of 'rough' material being required, as much of it consists of old shells and débris. It is usually sowed broadcast with shovels from boats. Further attention, other than that required to keep the beds clean and free from enemies, is generally unnecessary, especially if culled seed has been used.

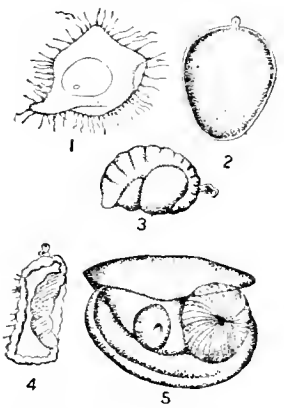
The system of spat-collecting is often extremely productive, though sometimes, for reasons not well understood, it results in complete failure. Spat will attach to almost any clean solid body, but certain materials, from their shape, structure, or cheapness, possess advantages which commend them. The most widely used and one of the best forms of cultch consists of the clean shells of the oyster itself. They are cheap, readily obtainable in all oyster regions, and, owing to their size and shape, can be used with success on bottom too soft for most other materials. The principal objection to them is that so many spat sometimes attach to a shell that they have no room for growth, and scallop (Pecten), jingle (Anomia), and other small fragile shells are sometimes preferable, as they catch the spat in smaller clusters and tend to break up as the oysters grow, but, owing to their lightness, they cannot be used in strong currents. The cost of oyster shells is from 2 to 5 cents per bushel, and sometimes they may be had for the hauling. Coarse gravel, pebbles, and crushed stone are used to a considerable extent in Long Island Sound and vicinity, but require a harder bottom than shells. The particles average about the size of a walnut or smaller, and as but few spat attach to each, the oysters are well shaped, less laborious to cull, and a larger proportion survive. This material costs from 5 to 8 cents per bushel and the cost of planting is about the same as of shells, ½ to 5 cents per bushel, according to local conditions.

Shells, stones, and gravel are distributed, like seed, from boats or scows. From 250 to 600 bushels per acre are used, soft bottom requiring more than hard. If there are extensive beds of adult oysters in the vicinity, and especially if the currents set from them to the spat-beds, they can be depended upon to supply the fry, but if not, adult oysters should be used in the proportion of 30 to 60 bushels per acre. The brood oysters should be planted several months before the spawning season, but the cultch should not be put down until spawning is about to begin, that it may be free from slime and sediment when the fry is ready to fix, even a thin coating of sediment being sufficient to suffocate the young oyster at that period.

Some planters allow the beds to remain unworked until the crop is ready to market, but to produce oysters of superior shape and quality, the clusters should be taken up and separated as soon as they can be culled without injury. It frequently happens that good localities for obtaining a set are not favorable to the production of marketable oysters, and in this case the culled young

may be transplanted with advantage and profit to beds possessed of an environment more favorable for the adults. Whether cultch or seed be planted, the beds should be closely watched to protect them from enemies which sometimes work havoc unsuspected until the time comes to market the crop.

The United States Fish Commission is experimenting with a system of fattening oysters artificially, by using fertilizers to stimulate the production of oyster food in ponds. Good results have been attained, but the commercial feasibility of the method has not yet been demonstrated. The alleged method of fattening oysters by feeding with corn meal is worthless. 'Plumping' them by placing in fresh or nearly fresh water is a bloating and not a fattening treatment, and is less resorted to than formerly. Oysters should not be planted or bedded in the vicinity of sewage contamination, as they may thereby become sources of disease infection, but there is no danger to be anticipated from the consumption of oysters from beds remote from sources of contamination. Green oysters are sometimes placed on the market. There are three types of greenness, two of which are perfectly harmless. The third type is evidently a pathogenic condition, correlated with the presence of copper; but, while the affected oysters are poor in quality, it is not demonstrated that they are dangerous.



OYSTER DEVELOPMENT.

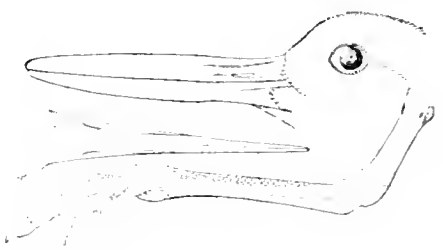
1, Unfertilized egg shortly after mixture of spawn and milt; spermatozoa are adhering to the surface. 2, Same egg a few minutes after fertilization; polar body at broad end. 3, Optical section of egg 27 hours after impregnation, showing two large cells, covered by a layer of small ectodermal cells. 4, Optical section of an older egg, now become flattened from above downward. 5, An embryo with well-developed larval shells.

In England oyster culture is practically along the same lines as in the United States. Shells are used to collect the spat, and seed-oysters are planted in favorable places, notably on the bottoms controlled by the Whitstable Company, a coöperative corporation. On the Continent the methods are more elaborate, the low price of labor and the high price of oysters, as well as the restriction of the area upon which they can be grown, tending to encourage an intensive system of culture. Tiles and fascines are generally used as spat-collectors, and especially in Holland and France a system of ponds or 'claires' is used for growing and fattening. Japanese methods somewhat resemble those of France and Holland in the recognition of a distinction between the bottoms used for spat-collection and for growing, although ponds are not used. Bamboo branches in regular arrangement are used for spat-collectors and the oysters are usually twice transplanted, first to a place favorable for rapid growth, and finally to beds especially rich in food, where they fatten.

BIBLIOGRAPHY. Huxley, *Oysters and the Oyster Question* (London, 1883); Ingersoll, *The Oyster Industry* (Washington, 1887); Brooks, *The Oyster* (Baltimore, 1891); Dean, *Report on the European Methods of Oyster Culture* (Washington, 1893); Moore, *Oysters and Methods of Oyster Culture* (Washington, 1897); Herdmann and Boyce, *Oysters and Disease* (London, 1899); Pottier, *Les huitres comestibles et Ostriculture* (Paris, 1902). Also the reports of the several State oyster commissions, and especially the United States Fish Commission *Reports* and *Bulletins*.

OYSTER BAY. A town, popular both as a residence place and as a summer resort, in Nassau County, N. Y., 30 miles northeast of New York City, situated on the northern coast of Long Island, on a deep sheltered bay, opening into Long Island Sound (Map: New York, G 5). A line of steamboats and a branch of the Long Island Railroad connect Oyster Bay with New York. The town offers attractions of fine scenery, and facilities for boating, bathing, and fishing. It has many handsome residences and a public library. The principal industry is oyster cultivation. The government is administered by town meetings, held every two years. Population, in 1890, 13,870; in 1900, 16,334. Within the limits of Oyster Bay is the village of Sea Cliff. Population, in 1900, 1558. Oyster Bay is the home of President Roosevelt.

OYSTER-CATCHER, or MUSSEL-PICKER. A long-legged shore-bird of the stilt family, having a long, hard, wedge-pointed bill. One species inhabits the northern part of the Old World, and another North America, but the term is occasionally extended to other related forms. The common one in the United States (*Hæmatopus palliatus*) is from 18 to 20 inches long, smoky brown above, with head and neck black, and white beneath. It is found on both coasts of both American continents, but rarely occurs



BEAK AND FOOT OF THE AMERICAN OYSTER-CATCHER.

north of New Jersey. It feeds on oysters, clams, and other mollusks, and breeds freely on the coast of Virginia. On the Pacific coast occurs an oyster-catcher (*Hæmatopus Bachmani*) which has no white in its plumage. Both of these feed largely on worms, crustaceans, and the like, as well as on mollusks. The European species (*Hæmatopus ostralegus*) is similar in all respects, and is known in Great Britain (where

it breeds numerously on all sandy coasts) as 'sea-pie' on account of its handsomely variegated black and white plumage, resembling that of the magpie. Consult Newton, *Dictionary of Birds* (London and New York, 1893-96).

OYSTER-CRAB. A small brachyuran crab of the genus Pinnotheres, the females of various species of which are about the size and shape of a pea, and hence are called 'pea crabs' in Great Britain. These females live as commensals (see COMMENSALISM), within the shells and mantle-lobes of various bivalved mollusks. A familiar American species is *Pinnotheres ostreum*, found in oysters, and bright reddish-yellow when cooked. It is esteemed a great dainty, and large numbers are used for food in the Eastern United States. Another species is very common in the wing-shells (Pinna) of the Mediterranean, and was imagined by the ancients to render important services to its host in return for its lodging, keeping a lookout for approaching dangers, against which the 'blind pinna' itself could not guard.

OYSTER-FISH. See TAUTOG.

OYSTER PLANT. See SALSIFY.

OYSTERS, LAW AS TO. Oysters are classed with animals *feræ naturæ* (of a wild nature), and, therefore, in their wild state may be gathered by any one when they are located on land under navigable waters. In England the cultivation of oysters has been protected and encouraged by statutes since the reign of Richard II. Most of the oyster beds in the waters about the British Isles are now enjoyed by virtue of special grants from the Crown or by lease from royal commissioners, or by prescription, that is, long continued possession and user under the laws of England. No one can appropriate to his exclusive use land under public waters for the purpose of establishing an oyster bed, but, after gaining the right by grant or lease, a person has an absolute ownership in the oysters he plants or deposits in the space allotted to him, and appropriation of them by another in such a case is punishable as a misdemeanor.

In the United States generally, after wild oysters are gathered and 'planted,' that is, placed in another location for the purpose of propagation, they remain the property of the person who has thus reclaimed them, even though he plants them on ground under public waters. This rule prevails in most States, even in the absence of statutes, but there are generally statutory provisions regulating the industry, especially in regard to giving notice to the public where a person appropriates land under public waters for an oyster bed, and also establishing 'close' seasons. Therefore, in most States any one has a right to prœmpt an unoccupied area under public waters and establish thereon an oyster bed. When a bed is once established, as long as it is maintained, the law protects the owner, as the person planting the bed is called, in his property right in the oysters, and in his possession of the area which his bed covers. The owner of an oyster bed is not only entitled to the oysters which he plants, in order to allow them to mature, but also to all off-spring from those oysters, within the limits of his bed. The statutes usually require one who claims an oyster bed to stake it off by means of long poles embedded in the mud at the bottom and extending above the surface of the water. This is for the purpose of giving notice to the general public and avoiding an innocent invasion of the owner's rights. A person cannot acquire property right to a bed of oysters by planting young oysters in a natural bed already containing oysters in sufficient quantities to make it profitable for the public to gather them. If a person thus mingles his oysters with others which the public may gather he loses all separate property right in them, and can only gather them as a citizen of the State. Natural oyster beds are defined to be those that are not planted by man, but where oysters are to be found growing in sufficient quantities to be valuable to the public.

Where no definite period for the enjoyment of the privileges of oyster beds is fixed by statute, the right to use the public land under water for such purpose is construed to be a conditional or qualified license, which is personal in its nature and not inheritable or transferable, and the State in which the beds are situated may at any time revoke the license and demand back the possession of the submerged land, giving the owner of the oysters a reasonable time in which to remove them. This right of the State will not ordinarily be exercised, and as the owner of the oysters may dispose of them in any way he sees fit, and as they will go to his representatives at his death, it is often popularly supposed that the possession of the submerged land itself is a property right in the person who is said to 'own' the bed. The occupation of an oyster bed by an individual does not interfere with the rights of the public to fish in the waters above the bed. Statutes of a State prohibiting citizens of other States from taking oysters or locating beds on lands under its navigable waters have been held to be constitutional. A person taking oysters from a private oyster bed, without permission, is guilty of larceny. See FISHING LAWS; FERÆ NATURÆ. Consult the local laws and decisions for specific information of local rights.

OYSTER-SHELL BARK-LOUSE. A popular name for the most abundant and widespread of scale-insects (*Mytilaspis pomorum*), which occurs most abundantly upon the apple, but is found also in various parts of the world upon pear, quince, hawthorn, willow, maple, elm, and many other trees. It was introduced into the United States from Europe at the close of the eighteenth century, and spread gradually throughout the country until it is now present practically wherever the apple is cultivated. The insect hibernates in the egg state under the old female scales. The young hatch in spring, wander out upon the twigs, and settle at once both upon the young twigs and the fruit. It occurs very rarely upon the leaves and is not common upon fruit, but frequently clusters upon twigs and limbs so as completely to cover the bark. In the Southern United States there are two generations each year, but in the North only one. After settling, the female molts twice and begins the formation of the scale. The male is much smaller than the female, and is distinguished by the fact that it has but one cast skin at its anterior end, whereas the female has two. The scale of the adult is of almost the same shape as an oyster shell, whence the popular name. The insect is readily destroyed in the

spring, after the young have hatched, by the application of a dilute kerosene emulsion in the form of a spray. Consult Howard, *Year Book of the United States Department of Agriculture* (Washington, 1894). See SCALE INSECT.

OZANAM, ō'zä'nän', ANTOINE FRÉDÉRIC (1813-53). A French Roman Catholic writer. He was born at Milan, and began to study law at sixteen, besides picking up several languages and contributing to the periodical press. In 1832 he went to Paris to pursue his studies, and took his doctor's degree in law after four years; in literature, six years later. He soon came into close relations with Chateaubriand, Lacordaire, and Montalembert, and threw himself ardently into the cause of the Church. With seven other students he founded the Saint Vincent de Paul Society. (See SAINT VINCENT DE PAUL, SOCIETY OF.) In 1839-40 he was professor of commercial law at Lyons, and in 1844 became professor of foreign literature at the Sorbonne. His special study was the history of mediæval civilization, particularly with the view of showing the beneficent influence of the Church and her doctrines. His health proved unequal to his diligence as a teacher, and after a year's sojourn in the Pyrenees he died at Marseilles, September 8, 1853. His collected works appeared in eleven volumes (Paris, 1862-65). Important among them are: *Dante et la philosophie catholique au treizième siècle* (1836); *Etudes germaniques pour servir à l'histoire des Francs* (1847-49); *Documents inédits pour servir à l'histoire littéraire de l'Italie* (1850). In English translations have appeared: *History of Civilization in the Fifth Century* (London, 1868); *Protestantism and Liberty* (ib., 1874); and his letters, with sketch of his life (ib., 1886). There are biographies by O'Meara (Edinburgh, 1876); Legeay (Paris, 1854); and de Montrond (Lille, 1869).

OZANAM, JACQUES (1640-1717). A French mathematician, born at Bouligneux, of Jewish descent. He was trained for the Catholic priesthood, but after his father's death devoted himself to mathematics, and taught at Lyons and then in Paris, where, in 1701, he was admitted to the French Academy of Sciences. His works include: *Tables des sinus, tangentes et sécantes* (1670; 3d ed. 1710); *Dictionnaire mathématique* (1690); *Récréations mathématiques et physiques* (1694), which was frequently republished (in English by Hutton, 1803); and *La perspective théorique et pratique* (1711; 2d ed. 1720).

OZARK' MOUNTAINS. A low, dome-like plateau or uplift in the Mississippi Valley between the Missouri and the Arkansas rivers (Map: Missouri, C 5). It covers the greater parts of southern Missouri and northern Arkansas, and extends some distance into Kansas and Indian Territory. It consists of Paleozoic rocks, and in many respects resembles the Alleghany plateau, but is much less dissected. It rises gradually from the north, but is somewhat escarped and rugged in its southern portion in Arkansas, where it is also heavily timbered, this part of the country being in marked contrast with the surrounding plains. The plateau nowhere rises much above 2000 feet. The Ouachita Mountains, south of the Arkansas River, are an outlying portion of the main plateau.

OZE'NA (Lat. *ozæna*, from Gk. ὀζαινα, *ozaina,* fœtid polypus in the nose, from ὄζειν, *ozein*, to smell; connected with Lat. *odor, olor,* odor). A term applied generally to diseased conditions of the nose characterized by great fetor of the breath. It may be due to syphilitic necrosis of the intra-nasal structures, or to tubercular or malignant ulceration. When due to these causes there is an accompanying purulent discharge from the nostrils. The morbid secretions accumulate in the nasal passages and form dry crusts over the mucous membrane. These decompose and give rise to the peculiarly offensive odor from which the disease derives its name.

The disease is chronic and difficult of management. Much benefit, however, is secured from the removal of the fetid crusts and secretions by the frequent use of alkaline and antiseptic douches, followed by the application of stimulating substances to the affected mucous membrane. The general treatment in the specific form of the disease consists in toning up the general health. A change of climate is often beneficial. When the fetor is due to syphilitic or other trouble, the treatment must be directed to the disease which causes it.

OZEROFF, ō'zye-rôf, VLADISLAV ALEXANDROVITCH (1770-1816). A Russian 'pseudoclassical' dramatic writer. He graduated from the Cadet Corps, was adjutant to its director, served in the army and the Department of Forestry, and in 1808 retired, with the rank of major-general, to devote himself to literature. An admirer of the French 'Classicists,' he closely imitated Ducis's *Œdipe à Colonne* in his first success, *Œdipus at Athens* (1804). His fame grew with *Fingal* (1805), which was based on Ossian, and reached its zenith in *Dmitriy Donskoy* (1807). *Polyxena* (1809), though unsuccessful with the public, was his favorite tragedy. The fifth edition of his works appeared at Saint Petersburg in 1856.

OZOCERITE, OZOKERITE (from Gk. ὄζειν, *ozein*, to smell + κηρός, *kēros*, wax), or NATIVE PARAFFIN. A yellow, brown, and sometimes green, wax-like substance, originally found in Moldavia and Austrian Galicia, and more recently in Emery and Uinta counties, Utah, where it occurs in the form of small veins in Tertiary rocks. It consists chiefly of a mixture of hydrocarbons, is greasy to the touch, and melts between 56° and 63° C. (133° and 114° F.). It finds some use in the manufacture of candles, as an adulterant or substitute for beeswax, and in the manufacture of ointments and pomades. A residual product obtained in purifying ozocerite, having a hard waxy nature, is combined with india-rubber and used as an insulating material ('okonite') for electric cables.

OZONE (from Gk. ὄζειν, *ozein*, to smell), or ACTIVE OXYGEN, O_3. A colorless gaseous allotropic modification of oxygen. (See ALLOTROPY.) In 1785 Van Marum observed that oxygen gas through which an electric current had been passed, as well as the air or oxygen in the vicinity of an electric machine, possessed a peculiar odor somewhat resembling chlorine. He referred to it as the 'smell of electricity.' In 1801 Cruikshank observed a similar odor when water was decomposed by electrolysis. Schönbein, in 1840, investigated the matter and established the fact that the odor was due to the formation of new gas, which he named ozone. He showed that ozone was generated by the action of phospho-

rus on moist air, and that it was capable of liberating iodine from potassium iodide. Its constitution was a matter of doubt until Soret determined the fact that it was an allotropic form of oxygen produced by the condensation of three volumes of oxygen into two of ozone. It is found in minute quantities in the atmosphere, of which it is regarded as a normal constituent, and its presence is believed to be due to the electric discharges during thunder storms, silent discharges from thunder clouds, vibrations of water, especially of saline waters, as in sea foam, and the action of some vegetable products on the air. Ozone is also said to be formed by the action of sunlight on clouds and the blueness of the sky has been attributed to its presence. Ozone is formed when a series of electric sparks is passed through oxygen or air, and it is evolved at the positive pole in the electrolysis of acidulated water. The slow oxidation of phosphorus in air yields ozone, and it may also be obtained by the action of strong sulphuric acid on barium peroxide. Certain organic substances, such as turpentine, various essential oils, etc., generate ozone when exposed to the air.

Ozone is a gas with a strong penetrating odor resembling that of diluted chlorine. When condensed under a pressure of 125 atmospheres at —103° C., it forms a deep blue liquid. It is more strongly magnetic than common oxygen. It decomposes slowly even at ordinary temperatures. It is a very strong oxidizing agent, converting copper, mercury, silver, and iron into their oxides. It oxidizes most organic compounds, destroying rubber and vulcanite with great rapidity; also it bleaches many colored vegetable and animal products, such as indigo, litmus, blood, etc. Its powerful oxidizing properties are taken advantage of for commercial purposes and its artificial production for the purpose of purifying the air of sick-rooms has been recommended. It finds some application for bleaching, as in the case of discolored engravings, where the printed portion is rolled up and inserted in a glass vessel, on the bottom of which some water and pieces of phosphorus have been placed. It has also been used to oxidize alcohol to aldehyde and to vinegar, and for the rapid aging of liquors. Slightly ozonized air and oxygen are used medicinally, especially in pulmonary complaints, although if too strong it is said to produce harmful effects, causing headache and irritating the mucous membranes of the respiratory organs.

P

P The sixteenth letter in the English alphabet. It can be traced through the Latin and Greek alphabet to the Semitic *pē*, 'mouth,' probably so called from the originally elliptical shape of the letter. The form of the letter is now esentially Roman, which differed from the Greek in that the second stroke was bent round to meet the first.

Phœnician	Early Greek	Later Greek	Early Latin	Later Latin

PHONETIC CHARACTER. As a phonetic character, *p* is the breathed or surd labial stop consonant corresponding to the voiced *b*. In forming the sound the lips are closed for an instant, and the breath then escapes explosively. From the manner of its sound-formation it is termed an occlusive explosive. The sound *p* is often voiced to *b*, which may then become the closely related *f* or *v*, as Latin *episcopus*, 'bishop,' Spanish *obispo*, French *évêque*, English *bishop;* Avesta *xšapan*, 'night,' Persian *šab*, North Baluchi *šaf*, Kurdish *šav*. *P* in Sanskrit, Greek, and Latin becomes Germanic *f* by Grimm's law (q.v.), as Sanskrit *pād*, 'foot,' Greek *πόδ-αύ*, Latin *ped-em*, English *foot;* Sanskrit *napāt*, 'grandson,' Latin *nepos*, Anglo-Saxon *nefa*, English *nephew*. In English, *p* represents an original Indo-Germanic *b*, which was, however, of rare occurrence. No example of initial *p* from this original *b* exists in English. As examples of medial *p* from Indo-Germanic *b* may be cited Sanskrit *sabdr*, 'nectar,' English *sap;* Latin *lubricus*, slippery, English *slippery*. The digraph *ph* is pronounced *f*, as in *pharmacy, phonetic*, and is written *f* in Spanish and Italian, as *farmacia, fonético*. In English words beginning with *pn, ps*, and *pt*, as *pneumatic, pseudonym, pteropod, p* is silent. Such words are of Greek origin, as in pure Latin *p* combines initially only with the consonants *l* and *r*. A *p* in Latin is often euphonically inserted between *m* and *s*, and *m* and *t*. This *p* is retained in English derivatives of such words, as for example, *redemption, sumptuous*.

AS A SYMBOL. In Hebrew and Greek ⊃ and Π stood for 80; in mediæval numbers, P for 400, and P̄ for 400,000. In chemistry, P is the symbol for phosphorus. In music *p* is the abbreviation of piano (softly), and *pp* of pianissimo (very softly).

P is the abbreviation of Latin *post* in P.M. (*post meridiem*) and in P.S., postscript.

PAARL. The capital of a district of Cape Colony, South Africa, on the southern slope of the Drakenstein range, 36 miles by rail northeast of Cape Town (Map: Cape Colony, E 9). It is the centre of a fruit-growing region, which is the wine-producing district of the colony. It dates from an ancient Dutch settlement, and derives its name, signifying 'pearl,' from a neighboring granite rock of pearl-like appearance. Population of the town, in 1891, 7668; of the district, 21,363, of whom 13,137 were native blacks.

PAASCHE, pä'she, HERMANN (1851—). A German economist and authority on the sugar industry. He was born at Burg, near Magdeburg; studied at Halle; became professor at Rostock (1879), at Marburg (1884), and in the Berlin Polytechnic Institute (1897), and was elected to the Reichstag as a member of the National Liberal Party in 1881. Since 1893 he has also been a member of the Prussian Lower House. Paasche wrote: *Studien über die Natur der Geldentwertung und ihre praktische Bedeutung in den letzten Jahrzehnten* (1878); *Wandlungen in der modernen Volkswirtschaft* (1890); *Zuckerindustrie und Zuckerhandel der Welt* (1894), his most important work; and *Kultur- und Reiseskizzen aus Nord- und Mittelamerika* (1894).

PABIANICE, pä'bya-nyē'tse. A manufacturing town in the Government of Piotrkow, Russian Poland, situated about 10 miles southwest of Lodz (Map: Russia, A 4). It has textile mills, and manufactures paper and agricultural machines. Population, in 1897, 26,892.

PA'CA (Neo-Lat., from *pak, paq*, the native name in Brazil), or SPOTTED CAVY. One of the largest of the agoutis (*Cœlogenys paca*), found from Paraguay to Venezuela east of the Andes. It is about two feet long and dark brown in color, with four rows of white spots along the sides, and the throat and belly black. The form and gait are clumsy, yet the paca is quick and agile. It lives in moist ground, makes burrows, and feeds on plants, often damaging sugar plantations. The skull of this animal is remarkable for the great development in the breadth of the jugal arch, inclosing a large cheek cavity, which gives an extraordinary breadth and swollen appearance to the face. One or more other species (or varieties) inhabit the high Andes of Ecuador, and are much sought after as food by the aid of trained dogs. Consult Beddard, *Mammalia* (London, 1902).

PACA, WILLIAM (1740-99). An American political leader and jurist, one of the signers of the Declaration of Independence, born at Wye Hall, his father's estate on the eastern shore of Maryland. He studied at Philadelphia College, then went to England, where he was entered at the Middle Temple, London, and in 1764 was admitted to the bar. He began the practice of law at Annapolis, and in 1761 was elected to the Legislature. He served again from 1771 until 1774, when he was chosen a delegate to the Continental Congress, of which body he continued to be a member until 1779. Personally a strong advocate of the independence of the colonies, his hands were tied by the instructions of the State convention, which as late as the middle of May, 1776, declared against a policy of separation. Paca and his supporters labored to secure a reversal of these instructions, and on June 28th the convention gave its delegates power to vote on the question according to their own judgment. Paca was a member of the State Senate in 1777-79, and from 1778 to 1780 was Chief Justice of Maryland. He was then Chief Justice of the Court of Appeals in 1780-82, and was Governor of Maryland from 1782 to 1785. He was a delegate to the State convention which ratified the Federal Constitution in 1788, and in 1789 was appointed United States judge for the District of Maryland, an office which he held until his death.

PACAY, pä-kā′ (Quichua name). *Prosopis dulcis*, or *juliflora* according to some authorities. A tree of the natural order Leguminosæ, suborder Mimoseæ; a native of Peru, of rather large size, with a broad head; producing pods from 20 inches to 2 feet long, which contain black seeds imbedded in a white sweet flaky substance, used as an article of food. The ground pods are fed to stock.

PACCA, päk′kä, BARTOLOMMEO (1756-1844). An Italian diplomat and cardinal. He was born at Benevento, studied at Naples and Rome, and in 1785 became Chamberlain to Pius VI., who advanced him rapidly, made him Nuncio to Cologne in 1786, and sent him as special envoy to Louis XVI. in 1791. From 1795 to 1800 Pacca was Nuncio to Lisbon. One of the most prominent of the anti-French party, he was captured with the Pope in 1809 and imprisoned for two years. He urged Pius to break the agreement of Fontainebleau, and in consequence was banished by Napoleon (1814), but was rewarded after the fall of the Empire and received in 1830 the See of Ostia and Velletri. He remained a strong opponent of reform. Pacca wrote *Memorie istoriche* (1830), *Notizie sul Portogallo* (1835), and *Relazione del viaggio di papa Pio VII.* (1833).

PACCHIONIAN (päk′ki-ō′nī-an) **BODY**, or GLANDULA PACCHIONI. One of numerous small, whitish granular-looking bodies, collected together in clusters of varying size, found upon the human meninges, or cerebral membranes, principally in the following localities: Upon the *outer* surface of the dura mater, in the superior longitudinal sinus, being received into little depressions, called Pacchionian depressions, on the inner surface of the skull; upon the *inner* surface of the dura mater; in the superior longitudinal sinus (a large venous canal, or vein, attached to the inner surface of the skull, running from before backward); upon the pia mater, near the margin of the hemispheres. They are named after Antonio Pacchioni, an Italian anatomist (1665-1726). The Pacchionian bodies are not glandular in structure. They are produced by an increased growth of the villi of the arachnoid. They not infrequently contain small, hard, calcareous concretions called 'brain sand.' Their growth and consequent pressure produces absorption of the dura mater, through which they pass to the inner surface of the skull as well as into the superior longitudinal sinus. These bodies do not occur in infancy, and very seldom before the third year; usually after the seventh, increasing after this as age advances. Sometimes they are wanting. Their function is supposed to be that of lymph channels, for the outflow of lymph from the subdural and subarachnoid spaces into the sinuses of the dura mater. Consult Landois and Stirling, *Physiology* (Philadelphia, 1903).

PACCIOLI, pä-chō′lē, **PACIOLI**, or **PACIUOLO**, pä′chē-o͞o′lō, LUCA, or LUCAS, DE BORGO (c.1440-c.1515). An Italian mathematician, born at Borgo San Sepolcro, in Tuscany. He was a Franciscan monk, and in his younger days, had traveled extensively in the East. He taught mathematics at Florence, Rome, and Venice, and then took orders under the name Fra Luca Sancti Sepulchri. He afterwards taught in various Italian universities. His chief work was the *Summa de Aritmetica, Geometria, Proportioni et Proportionalita* (1494; 2d ed. 1523), a work which contained all that was then known of mathematics. This was the first important printed treatise on mathematics. Paccioli was a judicious compiler, and he exerted a powerful influence on the teaching of the sixteenth century.

PACE. See WEIGHTS AND MEASURES.

PACER (from *pace*, from OF., Fr. *pas*, step, from Lat. *passus*, step, pace, from *pandere*, to stretch; connected with *patere*, to lie open, Gk. πετανύναι, *petannynai*, to spread out). The ambling gait of the pacer, smooth, frictionless, and lateral, as distinguished from the diagonal gait of the trotter, has been appreciated from the earliest antiquity. In America the pacer long received slight encouragement in competition; yet against all odds, and mechanical contrivances to force the pacer to trot, his progeny continue to inherit his characteristics; and as it transpired that eventually pacers had greater speed than the trotter, he was first tolerated and then sought after. The time for a paced mile was gradually reduced from 2:28, until in 1897 "Star Pointer" made it in 1:59¼. The gaits of trotting and pacing are practically interchangeable, though it is still true that a fast trotter becomes a faster pacer. The *Narragansett pacer* is supposed to have been a descendant of the Spanish horse. Governor Robinson is said to have brought some Spanish horses from Andalusia to New England, and the breed was kept up to supply the demand for them in the Cuban trade, but with the falling off of the trade the industry was allowed to lapse, and the breed became extinct.

PACHACAMAC, pä′chä-kä′mäk, RUINS OF. The remains of a vast city of the Yuncas, the ancient coast Indians of Peru, situated about 20 miles southeast of Lima. It was their sacred city before the conquest of the Incas, and held the shrine of Pachacamac, the Creator or Maker of all things. The Incas, after they had subjugated

the Yuncas, erected here a great temple of the sun and a house of the Virgins of the Sun. The ruins cover four large hills which furnished abundant building material used in combination with bricks or adobes of sun-dried earth. The site is at present a waste of drifting sand, sometimes obscuring the buildings which in the rainless and frostless region are in a fair state of preservation. The city was well laid out, having broad streets and a surrounding wall with large gates for entering. The houses were great communal structures built in terraces like the New Mexican pueblos. There were capacious reservoirs and irrigation works; the hills were terraced and upon the level areas thus secured were located the temple and other buildings. The principal Yunca structure, the temple of Pachacamac, is located on a headland about 500 feet above the sea, which breaks at its feet.

The hill has been surrounded by four terraces, forming a semi-lunar pyramid, the summit several acres in area. The entrance is from the east and the ascent is by a series of ramps. The walls were at one time painted red and adorned with frescoes. The temple covers an area of 600×450 feet, and is an aggregation of rectangular buildings and sunken courts on the various terraces. The shrine is on the summit at the southern corner behind two projecting rocks. The Inca convent stands on low ground near a small lake. It is also built of adobe bricks and covers an area 350×200 feet. It consists of a square, terraced area covered with buildings, and from this extends a long wall having 18 cells on the inner face. At a right angle another wall extends to a square terrace backed also with a niched wall, in which a fine example of the round arch has been found.

Around the temple of Pachacamac is a vast cemetery in which the flexed bodies of the dead, wrapped in cloth and secured with a network of cord, were placed in vaults lined with adobe bricks and roofed with canes and rushes. Some of the tombs have three or more chambers. The objects buried with the dead consist of pottery, bronze, gold, or copper objects, textiles, weaving apparatus, pigments, food, and the like.

Pachacamac being a central shrine, first of the Yuncas and later of the Incas, was exceedingly rich; it is said that Pizarro secured here 1700 pounds of gold and 1600 pounds of silver at the sack of the temples. Consult: Squier, *Peru* (New York, 1853); Wiener, *Pérou et Bolivie* (Paris, 1880).

PACHECO, pä-chā'kō, Donna Maria. The wife of the Spanish patriot Juan de Padilla (q.v.).

PACHECO, Francisco (c.1571-1654). A Spanish painter and writer on art. He was born at Seville, and was a pupil of Luis Fernandez, an imitator of Raphael. Of small importance as a painter, he is remembered chiefly as the master and father-in-law of Velazquez, and deserves most lasting credit for his *Arte de la pintura* (Seville, 1639). The precepts of this work were for a long period considered of standard authority by Spanish artists, and it also contains many valuable historical notices.

PACHELBEL, Johann (1653-1706). An eminent German organist and composer, born at Nuremberg. First instructed there by Heinrich Schwemmer (1621-96), he next studied at Altdorf and Regensburg, and in 1674 went to Vienna, where he became assistant organist at Saint Stephen's. Called to Eisenach in 1678, he was successively organist there, at Erfurt (1678-90), Stuttgart, Gotha, and finally (from 1695) at Saint Sebaldus in Nuremberg. With Buxtehude, one of the immediate forerunners of Bach, he contributed much to the improvement of Church music, and was the first to introduce in Germany the overture form on the pianoforte. The few of his compositions that appeared in print include: *Musikalische Sterbens Gedanken* (1683); *Musikalische Ergetzung* (1691); *Acht Choräle zum Praeambuliren* (1693); *Hexachordum Apollinis* (1699). The manuscript of his important *Tabulaturbuch geistlicher Gesänge Markus Lutheri*, etc. (1704), is in the grand-ducal library at Weimar.

PACHMANN, päk'män, Vladimir de (1848—). A Russian pianist, born in Odessa. He first studied music under his father, a professor in the University of Odessa, an amateur violinist, and the friend of Beethoven, Weber, and other musicians. Subsequently he was sent to the Conservatory of Vienna, and, returning to Russia in 1869, made his first appearance as a pianist, and played also in Germany and France. In 1882 he went to London, and in 1890 traveled in the United States, making subsequent extended tours in 1892, 1899, and 1900. He became very popular in America and enjoyed a high reputation both there and in Europe, especially as a sympathetic exponent of the music of Chopin.

PACHO'MIUS, Saint. An Egyptian monk who is held to have been the first to substitute for the free asceticism of the solitary recluse a regular cenobitic system. He was born about the year 292, of heathen parents, served as a soldier, and was converted to Christianity by the kindness of certain Christians whom he encountered at Thebes. About 325 at Tabennæ, an island in the Nile, he founded the first monastic institution. The members agreed to follow certain rules of life and conduct drawn up by Pachomius, and to subject themselves to his control and visitation. His sister is said also to have embraced the cenobitic life, and to have established the first convent for nuns. The pair labored with so much diligence and zeal that, at their death, according to Palladius, not fewer than 7000 monks and nuns were under their inspection. Consult: Grützmacher, *Pachomius und das älteste Klosterleben* (Freiburg, 1896); Amélineau, *Etude historique sur Saint Pakhôme et le cénobitisme primitif dans la Haute Egypte* (Paris, 1887). See Monasticism.

PACHUCA, pä-chōō'kä, or Hidalgo. The capital of the State of Hidalgo, Mexico, situated 55 miles northeast of Mexico City (Map: Mexico, K 7). It is built in a mountain pass more than 8000 feet above sea-level, and its principal industries are derived from the rich silver mines of the district. These are among the most important in the country; they are said to have been worked before the Conquest, but still yield an annual output of 90,000 tons of rich argentiferous ore. It was here that in 1557 Bartolomé de Medina discovered the *patio* process of amalgamation, which is still considered the most economical process for reducing the peculiar ores of Mexico. Population, in 1895, 40,487.

PACHYDERMATA, pāk'i-dĕr'mā-tā (Neo-Lat. neut. pl., from Gk. παχύς, *pachys*, thick + δέρμα, *derma*, skin). The 'pachyderms,' an order of mammals in the system of Cuvier, including the rhinoceros, elephant, hippopotamus, tapir, hog, and other ungulate mammals regarded as 'thick-skinned.' The group was a thoroughly unnatural one and the name is no longer in scientific use, although it has been adopted into literary service as a synonym for insensitiveness. Several of these animals are illustrated on the Colored Plate of PACHYDERMS.

PACHYMERES, pāk'i-mē'rēz, GEORGIUS (1242-c.1310). A Byzantine historian. He was born in Nicæa, was educated there, and in 1261 went to Constantinople, his father's native city, where he entered the priesthood and held high office in both Church and State. He wrote a *Historia Byzantina*, covering the period 1255-1308, a valuable source for the reigns of Michael Palæologus and Andronicus II., which was edited by Bekker (Bonn, 1835).

PACIFIC OCEAN (from Lat. *pacificus*, peace-making, peaceful, from *pax*, peace + *facere*, to make). The portion of the water envelope of the earth which lies between America and Asia-Australia. The name Pacific was given to it by Magellan. On the north it connects with the Arctic by the Bering Strait, and southward it merges into the Southern Ocean, the parallel of latitude 40° S. being usually taken as the limit in this direction. Its waters communicate with the Indian Ocean on the west by numerous passages in the island chain extending from Southeastern Asia to Australia. The Pacific is the largest and deepest of the oceans. With the bordering seas—the Bering, Okhotsk, Japan, Yellow, Eastern, China, Celebes, Java, Molucca, Banda, and Arafura seas—which are regarded as its dependencies, it has an area of about 55,000,000 square miles, equal to the entire land surface of the globe. Its greatest length from north to south is about 7350 miles and the greatest breadth along the parallel of latitude 5° N., 10,300 miles.

THE PACIFIC BASIN. The configuration of the Pacific basin is quite irregular, although there are large areas where the bottom exhibits little relief. In general, the depth increases from southeast to northwest. A vast depression known as the Tuscarora deep extends from the Japan and Kurile islands eastward along the Aleutian chain toward the coast of North America. Within this area the depth exceeds 3000 fathoms and in places soundings of 4000 fathoms or more have been made. Another extensive deep lies south of the Tonga Islands, between the Chatham Islands and New Zealand on the west and the Maria Theresa Reef on the east. In the central part of the ocean are the Belknap, Miller, and Hilgard deeps. The deepest sounding—5269 fathoms—was made in 1900 off the island of Guam by the United States ship *Nero*. A sounding of 5155 fathoms and another of 5147 fathoms have been made north of New Zealand. These depths are much greater than have been found in any other ocean. The most extensive plateau in the Pacific lies southeast of New Guinea and includes the Solomon, Ellice, Fiji, and Tonga islands, while a southern arm extends from the last-named group to New Zealand. The bottom within this area rarely exceeds 2000 fathoms in depth and much of it is less than 1000 fathoms. Other plateaus are occupied by the Marshall and Gilbert groups, by the Caroline Islands, the Low Archipelago, and Hawaii. A broad continental shelf extends along the eastern coast of Asia, but the western shores of America slope abruptly to the ocean floor. The mean depth of the Pacific is estimated at 2300 fathoms.

The proportion of land drained into the Pacific is insignificant when compared with the drainage received by the Atlantic. Its basin includes the generally narrow strip of the American continent to the west of the Rocky Mountains and the Andes, Melanesia, the Indo-Chinese States, China, a small part of Siberia, and eastern Australia.

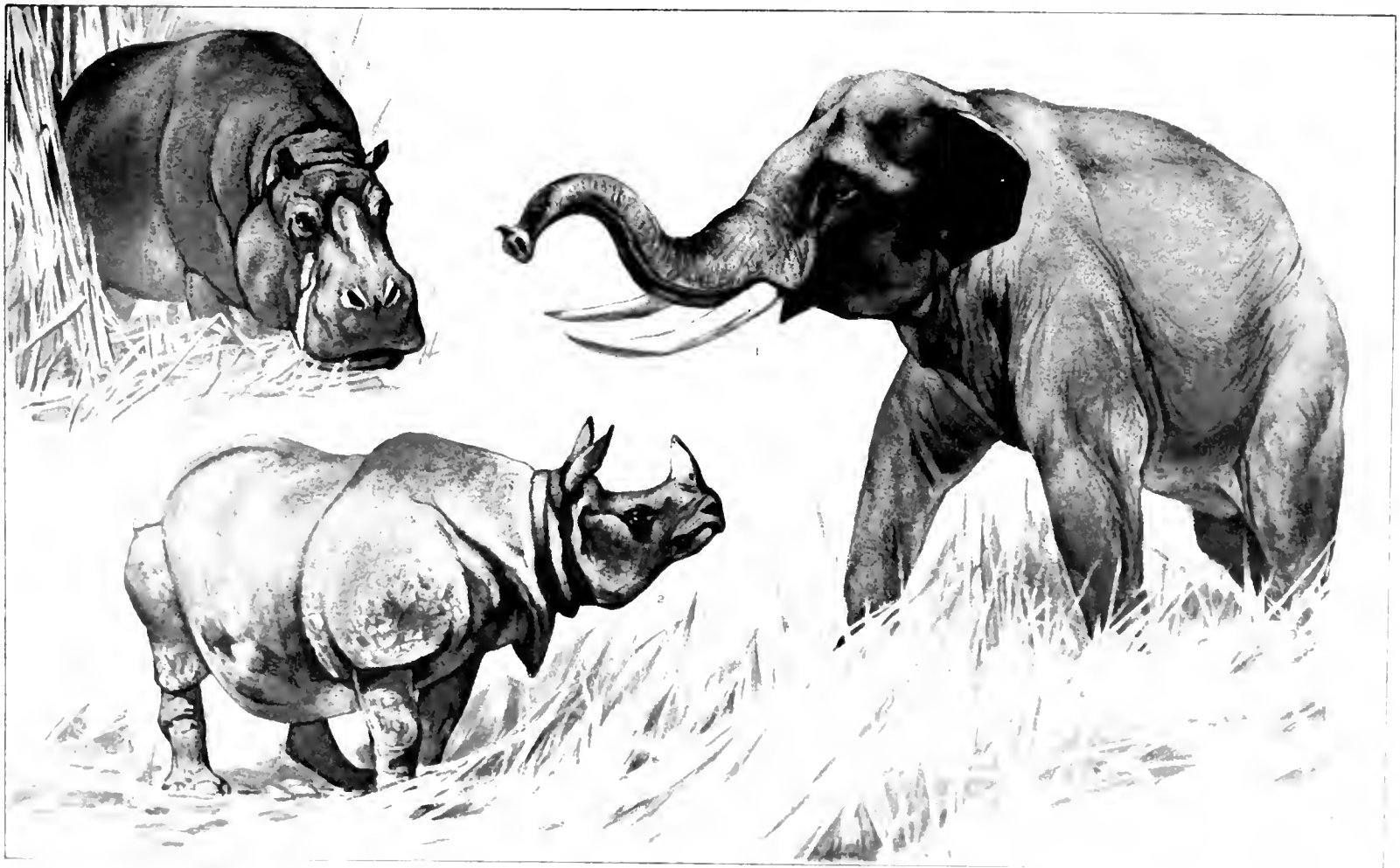
WINDS. In the trade wind belts of the Pacific the winds are generally quite uniform except when such belts approach the western coasts, where they are more or less modified by monsoon influences. In Polynesia hurricanes called typhoons are of frequent occurrence. North and south of the tropical zone the winds exhibit little regularity, being found to blow from all points of the compass during any given season of the year, though a westerly direction is most frequent. On the southern part of the coast of South America and the northern part of the coast of North America west winds prevail during the greater part of the year. In the Chinese seas the typhoon may occur at all seasons of the year.

CURRENTS. The currents of the Pacific Ocean are less marked in character than those of the Atlantic. In a general way the movement and direction of these currents follow the prevailing winds. In the northern trade wind belt a great equatorial current sweeps westward until at the western side it is largely deflected northward to the belt of westerly winds, where it flows northeastward as the Kuro Shiwo, or Japan Current, toward North America. A part of it subsequently turns southward along the American coast until it joins the equatorial current again; thus the surface drift of the northern Pacific Ocean constitutes a great eddy revolving slowly in the N.E.S.W. direction. In the southern Pacific a similar surface drift in the opposite direction, namely, north, west, south, east, is maintained, though not as well defined, because of the absence of the circumscribing continents. In the more quiet waters at the centres of these great eddies are the Sargasso or masses of floating seaweed, but these regions are very small compared with the large Sargasso Sea of the North Atlantic Ocean.

ISLANDS. The larger islands, with the exception of New Zealand, lie upon the continental shelf. The numerous small islands which rise out of great depths are one of the distinctive features of the Pacific. Most of these are of volcanic character, and in the equatorial region they are frequently surmounted by coral reefs. Consult Thomson and Murray, *Report of the Challenger Expedition* (London, 1880-95). See OCEAN.

PACIF'ICUS. The signature used in 1793 by Alexander Hamilton in a series of letters on neutrality. Madison replied to the letters in a number of essays signed *Helvidius*.

PACINI, pā-chē'nē, FILIPPO (1812-83). A prominent Italian anatomist. He was born in



Pistoia, studied medicine in Florence and Pisa, and became professor of anatomy at Florence. At twenty-three he made himself famous by discovering the peripheral nerve terminations which are called the 'corpuscles of Pacini' (or 'of Vater,' if the claim of the latter be considered). Pacini wrote much on anatomy, especially microscopic, and on pathology and therapeutics. His more important monographs include those on artificial respiration (1867, 1876, 1877, sqq.), which describe 'Pacini's method,' one of especial value in resuscitating asphyxiated new-born children.

PACINI, Giovanni (1796-1867). An Italian composer and teacher, born at Catania, and pupil of Marchesi and Furlanetto. His first opera, *Annetta e Lucindo*, was produced in 1813, and this was followed by forty-two operas during the subsequent twenty years. He was invariably successful, and was able to command the best theatres and artists in Italy. When one of his operas failed, he retired from the field of composition and devoted himself entirely to teaching, his school of music at Viareggio winning world-wide repute. His best work was done after 1840, the list of his compositions including about ninety operas, cantatas, masses, etc., besides numerous musical monographs and articles for musical periodicals. *Medea* (1843), *Saffo* (1840), and *Le regina di Cipro* (1846) are regarded as his best works. He died at Pescia.

PACINOTTI, pä'chē-nōt'tē, Antonio (1841—). An Italian physicist and electrician. He was born and educated at Pisa, taught there for two years, and at Bologna (1864-73), and, after nine years in the University of Cagliari, in 1882 became professor at Pisa. He is best known for his invention in 1860 of a dynamo in which the coils of the armature were wound on a ring. Subsequently the same device was independently discovered by Gramme, and was brought into extensive use in his machines.

PACK'ARD, Alpheus Spring (1798-1884). An American educator. He was a graduate of Bowdoin College, where he was tutor from 1819 to 1824, and professor of the Greek and Latin languages and literatures from 1824 to 1865. He became Collins professor of natural and revealed religion, and librarian in 1869, holding both offices until his death. During the last two years of his life he was acting president of the college. He edited and was joint author (with Nehemiah Cleaveland) of *The History of Bowdoin College, with Biographical Sketches of Its Graduates* (1882). He also edited: *Works of the Rev. Jesse Appleton, with a Memoir* (1836-37); *Xenophon's Memorabilia of Socrates, with English Notes* (1839; 3d ed. 1843); and contributed many articles to various periodicals.

PACKARD, Alpheus Spring (1839-1905). An American naturalist, born at Brunswick, Maine. He graduated at Bowdoin College in 1861 and at the Maine Medical School in 1864, and studied under Agassiz in the Lawrence Scientific School, Harvard University. In 1865-66 he was librarian and custodian of the Boston Society of Natural History; in 1867-78 curator and afterwards director of the Peabody Academy of Science, Salem; and in 1871-73 State entomologist of Massachusetts. From 1877 to 1882 he was a member of the United States Entomological Commission. In 1878 he was appointed professor of zoology and geology in Brown University. His chief work has been the classification and anatomy of arthropod animals, and contributions to economic entomology, zoögeography, and the phylogeny and metamorphoses of insects. In systematic zoology he proposed a new classification of the insects; a new grouping of the chief branches (phyla) of arthropods; a new order and several families of fossil merostomes, and the crustacean orders Phyllocarida and Syncarida. In comparative anatomy he discovered the brick-red renal glands of Limulus, the origin of the ovipositor, and that of the spiral thread of the trachea. His publications include: *Guide to the Study of Insects* (1869); *The Mammoth Cave and Its Inhabitants* (with F. W. Putnam, 1872); *Lyell's Story of Animals* (1876); *Insects Injurious to Forest and Shade Trees* (1890); *A Naturalist on the Labrador Coast* (1891); *A Text-book of Entomology* (1898); *Lamarck, the Founder of Evolution: His Life and Work* (1901).

PACKARD, John Hooker (1832—). An American surgeon, born in Philadelphia. He graduated at the University of Pennsylvania in 1850, and at the Medical School there in 1853. During the Civil War he was attached to the Christian Street and Satterlee army hospitals, with the rank of assistant surgeon, U.S.A. From 1863 until 1884 he was surgeon to the Episcopal Hospital, and from the latter date until 1896 he filled a similar position at the Pennsylvania Hospital. His publications include the translation of *Malgaigne on Fractures* (1859); *Manual of Minor Surgery* (1863); *Handbook of Operative Surgery* (1870); and *Sea Air and Sea-bathing* (1880).

PACKARD, Joseph (1812-1902). An American clergyman, of the Protestant Episcopal Church, born at Wiscasset, Me. He graduated at Bowdoin College in 1831, was a professor in Bristol College (Pa.) in 1834-36, and was ordained priest in 1837. From 1836 until his retirement as professor emeritus in 1890 he was professor of sacred literature in the Protestant Episcopal Theological Seminary of Virginia, near Alexandria. He was a member of the American committee for the revision of the Bible in 1872-85, contributed largely to Church periodicals, edited Malachi in the translation of J. P. Lange's Commentary (1874), and published *Questions on the Gospels* (1855).

PACKARD, Lewis Richard (1856-84). An American classical scholar born in Philadelphia, Pa. He graduated at Yale in 1856, studied further at Berlin University, in 1863 was appointed assistant professor of the Greek language and literature at Yale, and in 1866 full professor. In 1883 he was the second director of the American School of Classical Archæology at Athens. With J. W. White and T. D. Seymour he was editor of the "College Series of Greek Authors," of which one volume, the *Clouds of Aristophanes*, appeared in 1885. A collection of his lectures and essays was published in 1886 as *Studies in Greek Thought*.

PACKARD, William Alfred (1830—). An American classical scholar, born at Brunswick, Me. He graduated at Bowdoin in 1851, studied at Göttingen in 1857-58, and was appointed professor of the Latin language and literature in Princeton University. In addition to contribut-

ting to the *Presbyterian Review* and the *Princeton Review*, he revised the translation of Curtius's *Griechische Geschichte*, with translations from a later German edition.

PACK'ER, ASA (1806-79). An American capitalist, born at Groton, Conn. In 1822 he went to Pennsylvania, and eleven years later undertook the charge of one of the first boats on the Lehigh Canal. He became contractor for the building of locks and of boats for the transportation of coal from Pottsville to New York. He projected and completed (1855) the Lehigh Valley Railroad from Mauch Chunk to Easton. In 1844 he served in the Pennsylvania Legislature, and from 1853 to 1857 was a Democratic member of Congress. Having amassed great wealth, he gave liberally to charities, and founded and endowed Lehigh University (q.v.), Bethlehem, Pa., in 1866.

PACKER COLLEGIATE INSTITUTE. A school for girls in Brooklyn, N. Y., chartered in 1853, replacing the Brooklyn Female Academy, destroyed by fire in 1852. The new school was founded on a gift of $65,000 by Mrs. Harriet L. Packer. It has primary, preparatory, academic, and collegiate departments. The attendance in 1902 was 587, including 110 collegiate, 261 academic, 180 preparatory, and 36 primary students, and the faculty numbered 49. The institute has thoroughly equipped buildings, valued in 1902 at $222,047, the total valuation of its property being $277,860. The library contained 8479 volumes.

PACKING INDUSTRY. The slaughtering of cattle, sheep, and hogs, and the utilization of their carcasses is an important industry in many American cities, especially in the middle West. The choicer parts of the animals are shipped in refrigerator cars and vessels to the markets of this country and Europe for consumption as fresh meat, while other parts, especially in the case of the hog, are *cured*, by smoking or salting. The fatty portions are converted into lard and commercial grease by rendering processes. (See DIGESTER.) The bones are converted into glue or fertilizers, and the hoofs and horns (see HORN) are used or sold for other purposes. The term *packing industry*, which was originally applied to the curing and packing of the flesh of the hog, has been extended, with the development of the industry, to include all the multitudinous operations connected with the utilization and transformation into merchantable form of the different parts of animals slaughtered for food, in so far as these operations are conducted in a single plant.

The history of the packing industry begins in New England, in the seventeenth century, where large quantities of pork were packed in barrels for foreign trade. The first packing house in the West was established in Cincinnati in 1818. Cincinnati continued to lead in the industry for many years, but is now surpassed by Chicago, while in many other Western cities, including Milwaukee, Kansas City, Saint Louis, and Omaha, the industry has risen to great importance. Prior to 1872 most of the slaughtering was done during the winter months. About this time chilling processes began to be developed, which have since been brought to such a state of perfection that animals are killed and their products prepared for the market with equal success and in equal amounts in mid-winter and in 'dog-days.' Indeed, the development of the packing industry is largely due to the application of artificial means of refrigeration (q.v.), for at the foundation of all successful meat-curing is the thorough chilling of the carcass.

Before cold storage of meat was introduced, it was customary to ship the living animals to Eastern markets, and the long and tiresome journey was both cruel to the animals and harmful to the meat. Now the meat, after thorough chilling, is shipped in refrigerator cars to Eastern cities and placed in cold-storage warehouses owned by the packing company, from which it is delivered to local dealers, or if it is to be delivered in Europe, it is transferred directly from the refrigerator cars to specially constructed chill-rooms in the ocean steamers, to be delivered in London, Liverpool, or Glasgow.

Labor-saving devices have been adopted at every step in the packing industry. The animals are killed, "hooked by the nose to an endless chain, passed through scalding vats, and then through an automatically adjusted scraper which deprives them of hair and bristles in a few seconds. The animals are then hoisted, head down, upon an inclined rail and disemboweled, beheaded, washed, trimmed, and whirled to the chill-rooms at the rate of twenty a minute." In dressing hogs, about 20 per cent. is offal and the rest is used as meat, of which only about 10 per cent. is sold as fresh meat. The other parts are cured, usually by pickling in brine for seven or eight weeks, and then smoking for twenty-four hours. The most profitable part of the industry is the manufacture of sausage. The meat used is chiefly trimmings, which are obtained from all parts of the establishment, a large part of them being head and hoof trimmings. The meat is chopped, mixed with potato flour and water, in the proportion of 40 per cent. meat, 40 per cent. potato flour, and 20 per cent. water. Certain spices are also added, including sage, pepper, salt, ginger, and mustard. The intestines, which are used for sausage casings, are cleaned by machinery. They are filled with the sausage by means of a stuffing machine, which consists of two cylinders, the steam cylinder and the stuffing cylinder, and a piston rod directly connected with the piston rod of the steam cylinder. The sausage casings are slipped over a tube attached to the open bottom of the stuffing cylinder, and through this orifice the casings are filled at a rapid rate.

Another important part of the pork-packing industry is the manufacture of lard (q.v.). Two grades of lard are made—leaf lard and steam lard. In the leaf lard of commerce, not only the pure leaf, but all sorts of trimmings from the belly of the animal are used. Steam lard is made from scraps taken from all parts of the animal, particularly from the feet, or even the feet themselves and the head bones.

In dressing cattle, the parts intended to be sold as fresh beef are allowed to cool for forty-eight hours and then shipped. In the canning of fresh beef, inferior meat is used, either poorer grades of cattle or poorer cuts. Since 1891 the whole packing industry has been under vigilant Government inspection.

STATISTICS. According to the twelfth census of the United States, $189,194,264 were invested in the packing industry in 1900. The annual

value of the product was $785,562,433. Since 1850 the number of establishments had increased from 185 to 921; the number of laborers employed from 3276 to 68,534; and the average yearly wages per laborer from $376 to $488. The detailed figures published show that in Eastern cities, as Boston, New York, Newark, there has been a decided falling off in the business, while in certain cities of the Middle West, as Saint Joseph, Mo., there has been a more than correspondingly marked increase. This is due to the tendency to conduct the business nearer the centre of cattle-raising, which is, of course, the great corn belt of the Middle West and the pasture lands still nearer the Rockies. The accompanying table shows the exports of this industry in 1900.

MEAT PRODUCTS EXPORTED FROM THE UNITED STATES IN THE YEAR 1900

(Taken from the Statistical Abstract for 1900)

	Pounds	Dollars
Beef products—		
Canned beef	55,553,745	5,253,982
Fresh beef	329,078,639	29,643,850
Salted or pickled beef	47,306,513	2,697,340
Other cured beef	2,319,165	197,051
Tallow	89,030,943	4,398,204
Hog products—		
Bacon	512,153,729	38,975,915
Hams	196,414,412	20,416,367
Pork, canned	8,496,074	658,402
Fresh pork	25,946,905	1,925,772
Salted or pickled pork	133,199,683	8,243,797
Lard	661,813,663	41,939,164
Lard mixtures and substitutes (cottolene, lardine, etc.)	25,852,685	1,475,064
Casings for sausages		2,307,571
Mutton	773,760	64,313

NUMBER OF HOGS, CATTLE, AND SHEEP KILLED IN VARIOUS YEARS IN THE LOCALITIES NAMED

(From *One Hundred Years of American Commerce*)

HOGS PACKED IN THE WEST

YEAR	Summer	Winter	Total
1844-45			790,000
1849-50			1,652,000
1854-55			2,124,000
1859-60			2,351,000
1864-65			2,423,000
1869-70			2,635,000
1874-75	1,200,000	5,566,000	6,766,000
1879-80	4,051,000	6,950,000	11,001,000
1884-85	4,059,000	6,460,000	10,519,000
1889-90	6,881,000	6,664,000	13,545,000
1894-95	8,812,000	7,191,000	16,003,000

CATTLE KILLED IN FOUR WESTERN CITIES

YEAR	Chicago	St. Louis	Kansas City	Omaha
1871-75	190,000	104,000	37,000	
1876-80	411,000	165,000	60,000	
1881-85	864,000	182,000	82,000	10,000
1886-90	1,696,000	210,000	341,000	170,000
1890-94	2,223,000	303,000	756,000	460,000

SHEEP KILLED IN FOUR WESTERN CITIES

1871	261,000
1880	405,000
1890	1,621,000
1894	3,564,000

BIBLIOGRAPHY. The twelfth census contains many statistics, and also a good account of slaughtering and meat-packing methods in the United States. Consult, also, Philip Armour's description of the industry in Depew, *One Hundred Years of Commerce in the United States* (New York, 1895).

PACK-SADDLE. Contrivances for the transportation of materials, whether of merchandise or military stores, by means of pack animals. The pack-saddle in most general use consists of crossed sticks, fastened to saddle-bars of long bearing. In the United States Army pack-animals are usually supplied with the aparejo (q.v.). Ammunition mules are equipped with pack-saddles, specially adapted for the carrying of ammunition boxes, which are placed in such a way as to admit of easy access when the animal is employed in supplying troops in action. See illustration accompanying MOUNTAIN ARTILLERY.

PACTO'LUS (Lat., from Gk. Πακτωλός, *Paktōlos*). The ancient name of a small brook of Lydia, in Asia Minor (now called Sarabat), which rises on the northern slope of Mount Tmolus. It flows northwest past Sardis (Sart) and empties into the Gulf of Smyrna. It is nowhere more than ten feet broad and one foot deep. The sands or mud of Pactolus once contained a good deal of gold, and were regarded as the source of Cræsus's vast wealth; but as early even as the time of Strabo, Pactolus had ceased to yield any of the precious dust.

PACU'VIUS, MARCUS (c.220-c.132 B.C.). A Roman writer of tragedies. He was born at Brundisium, Italy. Repairing to Rome, he soon acquired fame by his skill in poetry and painting. One of his pictures was hung in the Temple of Hercules in the Forum Boarium at Rome. His finest works were his tragedies, which showed eloquence and refinement. Fragments of thirteen of these, as well as of a *prætexta*, or tragedy, with a typically Roman plot, have been preserved. These have been collected by Ribbeck, *Scenicæ Romanorum Poesis Fragmenta* (Leipzig, 1897).

PADANG, pä-däng'. The capital of the Dutch possessions on the west coast of Sumatra. It is situated amid picturesque mountain scenery near the centre of the west coast (Map: East Indies, B 5). Its Malay inhabitants live mostly in bamboo huts, but the Europeans and Chinese have well-built houses of stone and wood, and there are several churches, schools, a hospital, large warehouses, and Government workshops. The town is the terminus of a railroad line into the interior, and has a lively trade with Java and the other East Indian islands as well as with Europe, exporting coffee, nutmegs, copra, tobacco, gum, cane, and hides. It is the station of a United States consular agent. Population, in 1895, 32,038.

PADDLE. A wooden implement with a wide flat blade at one end or both, used by canoeists in place of oars. It is held in the hands, not rested in a rowlock, and is dipped into the water with a nearly vertical motion. The double-bladed paddle is frequently used in canoes, though many sportsmen prefer the single blade, which is worked over one side of the canoe, the steering being accomplished by giving a particular twist to the paddle at the end of each stroke. The fact that the paddler faces the bow of his boat is frequently an appreciable gain, especially in threading narrow streams. See CANOE.

PADDLE-FISH (so called from the form of the snout). A fish (*Polyodon spathula*) of the

Mississippi River and its tributaries, which has the general appearance of a rather slender catfish, but is a ganoid with a skeleton chiefly cartilaginous. It is about five feet long, has a smooth dark-green skin without scales, and a long bony snout containing fine teeth, with which it digs up the mud at the bottom of sluggish streams in search of the minute animals upon which it feeds. It has much the habits of a catfish, but inferior flesh, and is known as the 'duck-billed' or 'spoon-billed' cat, or 'spade-fish,' both names referring to the spatulate form of its snout. It represents the order Selachostomi of the subclass Teleostomi and the family Polyodontidæ, and is closely allied to the sturgeons. A similar species inhabits China. See Plate of Sturgeons, Paddle-Fish, and Bowfin.

PADDLE-WHEEL. An appliance in steam-vessels by which the power of the engine is made to act upon the water and produce locomotion. It consists of a skeleton wheel of iron, on the outer portion of whose spokes flat boards, called floats or paddles, are fixed, which beat upon the water, and produce, continuously, the same effect as is given, in an intermittent manner, by the blades of oars. The use of paddle-wheels in conjunction with steam as a motive power dates from about the commencement of the nineteenth century, but the employment of the paddle-wheel itself is as ancient as the time of the Egyptians. A specimen is also known to have been tried in Spain in the sixteenth century.

In the usual form of paddle-wheel, called the radial, the floats are fixed, and it will be seen that a certain loss of power is involved, as the full force of the engine on the water is experienced only when the float is vertical, since when the floats enter or leave the water the power is mainly employed in depressing or lifting the particles of water. This resistance has great force at the moment of starting, or when progress is very slow, as is illustrated by the small power a paddle-steamer evinces when trying to tug a stranded vessel off a sandbank; but when in full progress, the action is less impeded by this circumstance, the water in front of the wheel being depressed, and that abaft being thrown into the form of a wave. The extent of the immersion much influences the economy of power, as will be readily understood if the consequences of immersion up to the centre of the wheel be imagined. An immersion somewhat over the top of the lowest float is about the most advantageous, and, in order that the floats may be as nearly as possible vertical when they strike the water, it is advisable to give the wheel as large a diameter as possible, and to place the axis at the highest available point in the vessel.

To overcome the drawbacks to the radial wheel, there was devised early in the nineteenth century the *feathering paddle-wheel*, in which the floats are mounted on axes, and are connected by rods with a common centre, which revolves upon a pin placed eccentrically to the axis of the paddle-wheel. By this method the floats are kept, while immersed, at right angles to the surface of the water. So long as the water is smooth the gain is great, consequently feathered floats are much used in river-steamers. Paddle-wheels have been almost entirely superseded by screw propellers (see Screw Propeller) on all vessels except river and lake boats. See Steam Navigation.

PAD'EMEL'ON (Australian name). A small wallaby or kangaroo (*Halmaturus thetidis*) of New South Wales. It inhabits scrubby districts, and is hunted both for its flesh and its hide. Several other species in Australia, New Guinea, and Tasmania belong to this genus, which is characterized by the absence of hair on the muffle.

PADERBORN, pä'dĕr-bôrn. A town in the Province of Westphalia, Prussia, situated at the source of the Pader (hence the name of the town), about 15 miles southwest of Detmold (Map: Prussia, C 3). It has a modern aspect, a considerable part having been rebuilt since the conflagration of 1875. The cathedral, which was built above the source of the Pader mainly in the thirteenth century, and which contains parts of the original twelfth-century structure, was completely restored in 1891-93. It is Gothic in style and contains among other treasures the silver coffin of Saint Liborius, which was substituted for the original one coined into dollars by Duke Christian of Brunswick in 1622. The Busdorfkirche, of the fourteenth century, and the Rathaus, dating from the fifteenth century, and recently restored, are noteworthy buildings. The chief educational institutions are a gymnasium, an institute of theology and philosophy (taking the place of the university, which was closed in 1819), seminaries for priests and teachers, and a *Realschule*. The town has railway shops, manufactures of glass, soap, and tobacco, distilleries, flour mills, etc., and carries on some trade in fruit, cattle, and wool. In the vicinity are mineral springs of considerable reputation. Population, in 1890, 17,986; in 1900, 23,502, chiefly Roman Catholics. Paderborn first came into notice when Charlemagne held a diet there in 777, and eighteen years later nominated the first bishop. It was surrounded with walls in the eleventh century, and in the Middle Ages enjoyed considerable political independence as a member of the Hansa. For its early adoption of Reformation principles it was forcibly deprived of its privileges in 1604 by the Prince-Bishop Theodore of Fürstenburg. The bishopric, founded in 795 by Charlemagne, was secularized in 1802. Consult Richter, *Geschichte der Stadt Paderborn*, vols. i., ii. (Paderborn, 1899-1903).

PADEREWSKI, pä'dē-rĕf'skē, Ignace (1859—). A famous Polish pianist and composer. He was born in Podolia, Russia. When only three years of age he showed great fondness for music, and at seven was placed under a teacher, making such rapid progress as a pianist that in five years he gave public recitals. He studied under Raguski at the Warsaw Conservatory, in which he became himself a professor at the age of eighteen. In 1884 he accepted a similar position at Strassburg, and in 1887 made his formal début in Vienna, and was at once placed in the foremost rank of pianists. In 1890 he created a furor in London by his marvelous playing, and in 1892, 1893, 1895-96, and 1899 appeared in the United States. As a virtuoso pianist Paderewski must be placed among the very greatest performers that the world has yet seen. His pronounced individuality, his freedom from affectation, together with a vivid appreciation of tone gradations and values, a wonderful technique and mastery of the pedal, and a singularly intellec-

tual conception and interpretation of the great masterpieces of his repertoire, easily determine him as the greatest pianist of his day and generation. For his three months' season in the United States in 1895-96 he received the net sum of $200,000, and he gave to specially appointed trustees, for a fund to encourage American composers, $10,000. In 1902 he again visited the United States and personally conducted his opera, *Manru*, which met with an enthusiastic reception. His works, consisting largely of compositions for the piano, have become widely known; they include: *Prelude and Minuet*; *Elégie*, *op. 4*; *Danses polonaises*; chamber music; songs; and the grand opera *Manru* (1900).

PADIHAM, pād'i-hum. A town in Lancashire, England, on the Calder, 4 miles northeast of Accrington. Its industries comprise cotton mills, collieries, and stone quarries. Its parish church dates from the fourteenth century; it has an anciently endowed national school. Population, in 1891, 11,300; in 1901, 12,200.

PADILLA, pä-dē'lyä. The capital town of the Department of Chuquisaca, Bolivia, 90 miles northeast of Potosí (Map: Bolivia, E 7). It received its name in memory of the patriot guerrilla Manuel Ascensio Padilla, who met his death in the battle of Villar, September 14, 1816. Its population is about 4000.

PADILLA, JUAN DE (1484-1521). A popular hero of Spanish history. He came of a noble family of Toledo, was commandant of Saragossa in 1518, and administrator of his native city in 1520. While he was so employed, a formidable rebellion, caused by the excessive taxes which the Emperor imposed on the Spaniards to defray the cost of his various wars in Italy, Germany, and the Low Countries, broke out among the towns (*comunidades*) of Castile, and the rebels, who were known as *comuneros*, called upon Padilla to put himself at their head. Padilla for a short time was all-powerful, and formed a new junta to carry on the government. He was successful in a number of enterprises undertaken against the Royalist party, but on April 23, 1521, was completely beaten by the Royalists at Villalar. This conflict decided the fate of the rebellion, and of Padilla himself, who was taken prisoner, and on the following day beheaded.

His wife, MARIA PACHECO, rallied the wrecks of the rebel army, and for a long time held the castle of Toledo against the Royalist army, and after its fall in February, 1522, retired to Portugal, where she died in 1531. The deeds of Padilla and his wife have often been celebrated in Spanish song.

PADISHAH, pä'dē-shä' (Pers. *pādishāh*, king, from *pād*, Skt. *pati*, master, protector, from *pā*, to protect + *shāh*, OPers. *xšāyaθiya*, king, connected with Av. *xšī*, Skt. *kṣī*, to rule). One of the titles of the Sultan of the Ottoman Empire and of the Shah of Persia. Formerly this title was accorded only to the kings of France among European monarchs. It was subsequently allowed to the head of the House of Austria, and still later, by a special article in the treaty of Kutchuk-Kainarji (1774), to the Autocrat of All the Russias. Of late it has been accorded to the monarchs of all the great European nations, and even to those of secondary States.

PADOVANINO, pä'dō-vä-nē'nō, IL. The name commonly applied to the Venetian painter Alessandro Varotari (*q.v.*).

PAD'UA. The capital of the Province of Padua, Italy, situated 22 miles by rail west-southwest of Venice (Map: Italy, F 2). Several arms of the Bacchiglione, here canalized, flow through the city and are crossed by a number of old Roman bridges. The city lies in a compact shape in one of the richest gardened plains of Italy. The ancient, narrow, crooked streets are generally arcaded. The arcades, however, are being removed gradually to accommodate the increasing traffic. There are seven city gates.

The cathedral is of no particular interest, but its baptistery is a handsome brick conception of the twelfth century. The fine and immense San Antonio Church is identified with Saint Anthony, the patron saint of the city. It dates from the middle of the thirteenth century, and was restored about 500 years later. The saint is entombed here. The edifice has six domes, and is fashioned after the Byzantine Saint Mark's of Venice, with Gothic features added. The most valuable of its numerous contents are a monument by Al. Vittoria; a collection of goldsmith's work of the Renaissance period; a bronze candelabrum by A. Riccio, by whom are also valuable biblical reliefs in bronze; the high altar by Donatello; the exquisite white and gold decorations on the ceiling; the ambitious Renaissance Cappella del Santo; and a Madonna by A. Boselli. Before San Antonio stands Donatello's splendid equestrian bronze statue of the Venetian General Gattamelata.

Another fine church is the spacious Santa Giustina, begun by Riccio. Its façade is brick, with one of the many noble flights of stairs for which Padua is famous. Domes and cupolas add to the impressiveness of the edifice. In the interior are the fine "Martyrdom of Saint Justina" by Veronese, and handsome choir stalls. The adjoining cloister is used as barracks. In the northeastern part of the city are the Madonna dell' Arena and the Eremitani. The former is a fine chapel dating from the beginning of the fourteenth century. It is situated in an attractive garden, and is remarkable for its frescoes by Giotto, most of them in a good condition. The Augustinian Eremitani, dating from the thirteenth century and restored in 1880, contains scarcely less valuable and important mural paintings by Mantegna and other members of the school of Squarcione. The Mantegna pictures were painted between 1450 and 1460, the life of Saint James furnishing a part of the subjects. There are also found here, in the sacristy, a "Pietà" by Canova, and a "John the Baptist" by Guido Reni.

Among the notable palaces of Padua is the Palazzo della Ragione, belonging to the twelfth century, with a vast mediæval hall (Salone) 273 feet long, 90 feet wide, and 78 feet high. Donatello's celebrated wooden horse is here. The Loggia del Consiglio is a charming example of the early Renaissance. An arcade reached by majestic stairs. In the vicinity are found a statue of Victor Emmanuel II. and a column bearing a Lion of Saint Mark. Padua possesses also a monument to Petrarch, models of statues of Dante and Giotto, both by Vela, a [illegible] ment to Cavour, and a statue of [illegible]. The Scuola del Santo, occupied by the Brotherhood

of Saint Anthony, has three fine mural paintings by Titian. The chapel San Giorgio near by has numerous excellent frescoes by Altichieri and J. Avanzi. Among the objects of interest in the city is Dante's house, in front of which is an ancient tomb, containing, according to tradition, the ashes of Antenor, the legendary founder of Padua.

On the Via dei Servi, the main business street, stands the university (q.v.), far famed as a seat of learning in mediæval times. It occupies an edifice known as Il Bò, distinguished by a court with attractive colonnades. Padua has a celebrated café, the Pedrocchi, almost entirely of marble, with noble halls and columns, the scene of student uprisings against the Austrians. The municipal museum, in a building reconstructed in the latter part of the nineteenth century by Boito, has an attractive façade, and contains the city library (110,000 volumes), the picture gallery, archives, and an interesting monument of the Volumnii. The picture gallery is not important. Its best work is Romanino's Madonna —an altar piece. In the southern part of the city lies the spacious Piazza Vittorio Emanuele, beautified with trees and embellished with the statues of eighty-two celebrated persons who have been associated with the city. Some of the marbles are by Canova. The piazza is the lively scene of the annual fair which commences on Saint Anthony's festival, June 13th.

The Botanic Garden of Padua, which is connected with the university, is well known as the oldest in Europe, having been established by the Venetian Republic in the middle of the sixteenth century. It has some exotic trees which have long been celebrated, and are associated with certain of Goethe's scientific investigations here. Also connected with the university are an observatory and a large and valuable library. There are in the city an archiepiscopal seminary, a lyceum and other high schools, a technical industrial school, an agricultural school, an industrial art school, and a silk-worm breeding institution. The industries of Padua include foundries, farm machinery works, an automobile factory, chemical factories, distilleries, etc. The city is the centre for the trade of Venetia, cattle, wine, oil, and grain being chiefly dealt in. It is particularly famous for its fruit. Canals connect Padua with the Adige, the Brenta, and the Adriatic. The population in 1901 was 82,281.

Padua claims its origin from the time of Troy. In the height of Rome's glory it was the most important town in North Italy. It was sacked by the Goths and the Huns. Charlemagne wrested it from the Longobards. In the middle of the thirteenth century it was the capital of the cruel tyrant Ezzelino (IV.) da Romano. Later it was for a time a republic, then passed under the rule of the Carrara family, and became the object of conquest on the part of Venice, to which it fell in 1405, and whose fortunes it afterwards shared. Livy and Mantegna were born here. In art history Padua is prominent. Mantegna shed his glory upon the city, and the influence of the Squarcione school, with which he was associated, is traced all over Northern Italy. Giotto, Donatello, and Fra Filippo Lippi also did much work in Padua. Consult Cappelletti, *Storia di Padova* (Padua, 1875).

PADUA, University of. One of the oldest and most famous of European universities. It had its inception in the emigration from the University of Bologna in 1222 of a large number of students owing to difficulties with the town authorities. The School of Martinus for the study of jurisprudence at Padua, however, is mentioned as early as 1190. The restless students found Padua as unaccommodating as Bologna, and in 1228 entered into a contract to emigrate to Vercelli, that commune promising 500 houses for the accommodation of students and other privileges. This contract was only carried out in part, and the university at Padua was not wiped out entirely. At first jurisprudence constituted the principal study, but soon the liberal arts came into vogue. During the tyrannical reign of Ezzelino (IV.) da Romano (1237-59) the university lost its prestige and was almost ruined, but with his death the town endeavored to improve its condition. In 1260 a code of statutes, modelled after those of Bologna, was drawn up, two universities, the Ultramontani and the Citramontani, were established, and the grammatical, rhetorical, and medical studies instituted. In 1263 Pope Urban IV. speaks of the 'Universitas Magistrorum et Scolarium Padue' as a recognized institution, and in 1264 confirmed the power of the Bishop to confer the licentiate degree. The fame of the university soon rivaled that of Bologna. In 1282 the Paduans attempted to force new statutes, prepared by them, on the university. This was vigorously resisted by the university and Pope Nicolas IV. An attempt was even made to transfer the university to some other place, but the difficulty was settled in 1290. In 1363 Pope Urban V. instituted theology as a *studium generale*. In the same year the first college was founded, the number increasing gradually henceforth. After 1390 the university received many foundations for poor scholars, and in 1390 Francesco Carrara presented it with its first building. In the fifteenth century it far outranked Bologna in renown. Humanism obtained a strong foothold here, and besides the professional studies, mathematics, modern languages, fine arts, and knightly exercises were eagerly pursued. At Padua were established the first botanical garden and anatomical theatre. The university became a favorite place with the Germans, there being, in 1564, 200 of them under the faculty of law. During the seventeenth century the fame of the institution gradually declined. In 1613 the complaint was made that there were only 1400 students. Still there were about 100 annual promotions in jurisprudence. At that period the university was famous for the licentiousness of the students, which hastened the decay of the once flourishing institution. In the beginning of the eighteenth century Augustin Leyser laments its total ruin. Under the Austrian régime, and later under the Italian government, strenuous efforts were made to re-establish the former fame of the university, and its regeneration has proceeded gradually. During the troublous period of 1848-50 the university was closed. In 1902 the University of Padua consisted of the following schools and faculties: (1) law, (2) medical-surgical, (3) mathematical-natural science, (4) philosophy, (5) engineering, (6) pharmacy. The attendance was over 1400. The library contained 136,000 volumes, 64,900

PÆSTUM

RUINS OF THE TEMPLE OF NEPTUNE (RIGHT) AND THE SO-CALLED BASILICA

pamphlets, and 2326 manuscripts. The university also includes a number of clinics, an observatory, a botanical garden, and a number of museums. For bibliography, see UNIVERSITY.

PADUCAH, pā-dū'kā. A city and the county-seat of McCracken County, Ky., 48 miles east by north of Cairo, Ill., and 165 miles southeast of Saint Louis, Mo.; at the confluence of the Ohio and Tennessee rivers, and on the Illinois Central and the Nashville, Chattanooga and Saint Louis railroads (Map: Kentucky, C 3). It has a United States Government building, hospitals, and public parks. The city is in an agricultural, mineral, and timber region; is the terminus of several river packet lines; controls large lumber and tobacco interests, besides an important wholesale trade; and has extensive manufactures of lumber products, furniture, brick, potter's ware, tobacco, cotton rope, wagon material, flour, and foundry and machine shop products. The building of steamboats is carried on. The government, under a charter of 1893, is vested in a mayor, who holds office for four years, and a council. The school board is independently chosen by popular vote. The electric light plant is owned and operated by the municipality. Paducah was laid out in 1827, incorporated as a village in the following year, and received a city charter in 1856. In September, 1861, it was occupied and fortified by General Grant, and on March 25, 1864, then having a garrison of about 800 men under Hicks, it was unsuccessfully attacked by General Forrest with a force of 5000. Population, in 1890, 12,797; in 1900, 19,446.

PÆ'AN (Lat., from Gk. *παιάν, paian*, hymn in honor of Apollo, from Παιάν, *Paian*, Παιών, *Paiōn*, epithet of Apollo). An ancient Greek god of healing. Paean appears in Homer and later poets down to Æschylus as a personal god, a divine physician, invoked to cure disease and also to avert threatened destruction from other causes. From the middle of the fifth century B.C. we hear little of this god, and Pæan becomes a surname of Apollo, as the averter of disease and destruction. The hymn for deliverance, addressed probably originally to the god Pæan, with its refrain *ἰὴ* Παιάν, was also transferred to the worship of other gods, and became the name for a recognized division of the Greek choral lyric poetry. It was sung either in solemn procession or in a stately dance around the altar, especially of Apollo, though sometimes in connection with the worship of Dionysus, Asclepius, and others. We also find the word used to denote a prayer or hymn accompanying the libation at a sacrifice, or sung to the gods with the libation at the symposium or at the marriage feast. As a prayer for safety it was naturally chanted before the battle, and, indeed, before any undertaking where danger was anticipated. The refrain seems also to have become a shout of victory, as expressing thanksgiving for deliverance, and thus the Pæan is also the name for the hymn sung at the processions and the sacrifices in celebration of victory. Consult: Fairbanks, *A Study of the Greek Paean* (New York, 1900); Usener, *Götternamen* (Bonn, 1896).

PÆ'DOGEN'ESIS. See PARTHENOGENESIS.

PÆO'NIUS (Lat., from Gk. Παιώνιος, *Paiōnios*). A Greek sculptor of the latter part of the fifth century B.C. He was a native of Mende, probably the Thracian town, which was settled by Ionians, and is known by his statue of Nike (Victory), executed for the Messenians of Naupactus and erected as a trophy at Olympia, probably about B.C. 420. The statue stood on a triangular pedestal some thirty feet in height, and represented the goddess as in full flight toward the earth. The feet barely touch the pedestal, the support being afforded by the flowing drapery, which in its light folds suggests admirably the rush of the goddess through the air. Pausanias says that Pæonius also made the sculptures in the east pediment of the Temple of Zeus at Olympia, but this seems to be due to a misunderstanding of the inscription on the base of the Nike, in which the artist claims to have been the victor in making the figures on the extremities of the gables.

PAËR, pä-ār', FERDINANDO (1771-1839). An Italian composer, born in Parma. He was appointed chapel-master at Dresden in 1801; Imperial composer to Napoleon in 1807, and was director of the Italian opera at Paris in 1812-27. Besides a number of overtures and cantatas, he was composer of forty-three operas (the best is *Camilla*, 1799), which have long been forgotten. He is of interest more for the part he played in the musical life of his day, as shown by his appointments, and his rivalry with Rossini, his successful competitor for public favor, and for a time a joint conductor with him at the Théâtre Italien. He received the cross of the Legion of Honor in 1828; was elected to the Academy in 1831; and the year following became conductor of the Royal Chamber music. He died in Paris.

PÆS'TUM (Lat., from Gk. Παῖστον, *Paiston*, earlier Ποσειδωνία, *Poseidōnia*). An ancient Greek city of northwestern Lucania in Southern Italy, in the present Province of Salerno. It seems to have been founded under the name Posidonia, by Trœzenians expelled from Sybaris, probably not earlier than the latter part of the seventh century B.C. It does not appear prominently in the history of Magna Græcia, but its temples show it must have enjoyed considerable prosperity. About B.C. 400 it was captured by the advancing Lucanians, who, however, allowed the ancient inhabitants to remain, and even to mourn their lost glories at an annual festival. With the rest of the region it submitted to Rome, and in B.C. 273 was made the seat of a colony, but in the time of Strabo was reputed unhealthy, and gradually fell into neglect. In the ninth century the town was sacked by the Saracens, and after that the site seems to have been abandoned, and now is occupied only by a few houses and the fine ruins of three temples, commonly called the Temple of Poseidon, the Basilica, and the Temple of Ceres. They are all important monuments for the history of the Doric style, and are among the best preserved and most impressive examples of Greek temple architecture outside of Athens.

PAEZ, pä'ās. A mountain tribe of Colombia, occupying about twenty villages in the high Central Cordilleras, westward from Bogotá. They are believed to be the principal modern representatives of an ancient group of allied tribes, hostile to the more civilized Chibcha (q.v.), and constituting a distinct linguistic stock. They are hunters and go nearly naked in spite of the cold, but wear hats woven from reeds or bark. They also weave mats and cloth from maguey

fiers, and have some skill in hammering gold into ornaments. They burn the houses in which either a death or a birth occurs. They number about 2000.

PAEZ, José Antonio (1790-1873). A Venezuelan soldier and political leader, born at Araure in the old Province of Barinas. He was of aboriginal descent, and passed his early life as a herdsman on the llanos of the Apure. On the outbreak of the War for Independence he led a body of his half savage comrades to join the patriot ranks, and soon made his name a terror to the Spaniards. His most important victory was that of Carabobo in 1821, when he defeated the Spanish General Latorre and so assured the independence of Colombia. The next year he was given the chief military command in the Department of Venezuela, and in 1823 drove the Spaniards from Puerto Cabello, their last foothold in the Republic. In 1829 Venezuela, under his influence, seceded from Colombia, and in the following year he was elected its first President. At the end of his term in 1834 he was succeeded by Dr. José Vargas, during whose administration there were two attempts at revolution. Both were quickly suppressed by Paez, who in 1839 again became President and served until 1843. During the war between the Creoles and the colored people in 1846 he was made dictator, but at the conclusion of hostilities declined to become President, and resigned his powers to General Monagas. Scarcely a year later, however, he rebelled against the despotism of his successor, was defeated and captured, and was kept in prison until 1850, when he was allowed to leave the country. After the fall of Monagas, in 1858, he returned to Venezuela, and in 1860 was appointed Minister to the United States. The next year he was made commander of the army, and a few months later was proclaimed dictator. On account of age, he confided his duties to one of his ministers, who grossly usurped his power. The result was an insurrection which spread rapidly until, on June 15, 1863, Paez was forced to resign his office and again go into exile. In 1871 he went to New York, where he passed the last years of his life. In 1888 his remains were placed in the Pantheon at Caracas. Consult: *Autobiografia de General José Antonio Paez* (New York, 1867); Paez, *Public Life of J. A. Paez* (1864); Jones's translation of *The History of South America* (London, 1879), and Guzman Blanco's *Apotcosis de General Paez* (Paris, 1889).

PAGAN, pä-gän'. A town of the Myingyan District, Upper Burma, India, on the left bank of the Irrawaddy River, 92 miles southwest of Mandalay (Map: Burma, B 2). Population, estimated, 7500, chiefly Buddhists. Pagan was the capital of Burma from its foundation in A.D. 847 until 1284, when, to resist the advance of an avenging Chinese army, the Burmese ruler demolished a great part of the city to build fortifications, but finally abandoned the project and fled. The ruins of Buddhist temples and pagodas in every stage of dilapidation occupy an area along the river about 8 miles long by 2 miles broad. The best preserved and most important archæologically of the temples are the eleventh-century cruciform Ananda, occupying a square of 280 feet and rising to a height of 183 feet; the Thapinyu, 201 feet high, built in 1100; the Gaudapalin, 180 feet high, built in 1160; and the low quadrangular Bodhi, dating from 1200.

PAGANI, pä-gä'nē. A town in the Province of Salerno, Italy, on the Naples-Taranto Railroad, 21 miles southeast of Naples (Map: Italy, J 7). In the Church of San Michele is the tomb of Alfonso de Liguori, founder of the Order of the Redemptorists. There are manufactures of silk and cotton goods and matches. Population (commune), in 1881, 12,780; in 1901, 14,607.

PAGANINI, pä'gä-nē'nē, Niccolò (1782-1840). A famous violinist, born in Genoa, the son of a poor shopkeeper. Under his father's encouragement the child was early imbued with the ambition to become a great violinist, and formed the habit, which he maintained throughout his career, of incessant practice. He studied at first under Servetto, the leader of the Genoa Theatre, and two years later under Costa, the principal violinist and conductor in the Cathedral at Genoa, with whom he made his greatest progress. Other teachers were Gnecco, Alessandro Rolla, and Ghiretti. He produced his first sonata before he was nine years of age, and was also desired by his teacher to perform every Sunday in church a violin concerto, a practice to which Paganini attached great importance, in that it forced him to the constant study of new music. His first appearance in public was in 1793 at Genoa. In 1795 he went to Parma to become a pupil of Rolla, but there is some doubt whether the arrangement was carried out. About this time he evolved a style of fingering and a method of bowing peculiar to himself. Upon his return to Genoa he composed his first studies, which were of such unheard-of difficulty that he frequently was known to have spent ten or twelve hours practicing a single passage. So far, he had been wholly under the control of his father, whose only thought apparently was as to how far he could turn his son's talent to his own financial advantage; but in 1798, after a very successful concert at Lucca, he threw off parental control and made a tour of Pisa and other places. He was everywhere received with the utmost enthusiasm, and although but a youth, he unfortunately became intoxicated with the license of his life and plunged into all kinds of dissipation, especially that of gambling. Alternate periods of gambling and study, both pursued with equal zeal, reacted dangerously on his naturally weak constitution, with the result that illness frequently prevented his fulfilling engagements. On one occasion he was announced for a concert at Leghorn, but having gambled away his money and pawned his violin, he was compelled to appeal for the loan of an instrument to keep his engagement. In this emergency M. Livorn, a French merchant of Leghorn, lent him his Guarnerius, said to be one of the finest violins in the world. After the concert, when Paganini desired to return the instrument, its owner exclaimed, "Never will I profane the strings which your fingers have touched. That instrument is yours." Paganini used this instrument at all his concerts, and at his death bequeathed it to his native town of Genoa, where it is still preserved in the museum. From 1801 to 1803 he lived in comparative retirement at his home, dividing his attention between composition and the guitar, on which instrument he was very proficient. He took up

his concert tours in 1805, meeting, if possible, with greater enthusiasm than before. He was appointed Court solo violinist at Lucca, at which place he remained until 1808, and then for twenty years made concert tours in Italy. In 1828 he began his tours of other countries, commencing with Austria. His opening concert in Vienna was a complete triumph. The gold medal of Saint Salvator was conferred upon him by the city authorities; from the Emperor he received the title of Court virtuoso, and on all sides he was hailed as the popular hero. A similar success greeted him in Germany (1829) and in France (1831). His first appearance in London was on June 3, 1831, and in the year which followed he appeared in the principal cities of England, accumulating a considerable fortune. He then returned to Paris, but revisited England the following season. The winter of 1833-34 was spent in Paris, during which period he maintained a close intimacy with Berlioz, whom he invited to write a concerto for his Stradivarius viola, a request which resulted in the composition of "Harold en Italie." Four years later Berlioz received from Paganini a present of 20,000 francs as a mark of his admiration. In 1834 he returned to Parma and purchased several properties, in one of which, the Villa Bagona, he made his residence for two years. About this time his health gave signs of a complete breakdown. In 1836 he was persuaded to join some Parisian speculators in the establishment of a casino for music and gambling in the fashionable quarter of Paris. It was opened under the name of the Casino Paganini, but the Government refused to sanction gambling, and the venture proved a failure, with great financial loss to Paganini. The end of his career was rapidly approaching. He journeyed to Marseilles, and from there to Genoa, and shortly afterwards to Nice, in which city he died. His technic in double-stops, left-hand pizzicato, harmonics, and staccato approached the miraculous, while his power and control of tone and the intense passion of his style brought his audiences into instant subjection, so that he swayed them at will. He had many personal eccentricities and numberless tricks of virtuosity. His compositions were comparatively few, and included the following: twenty-four capricci for single violin; six sonatas for violin and guitar; three grand quartets for violin, viola, guitar, and violoncello (opus 4, 5); concerto in E_2 (solo part written in D, for a violin tuned a semitone higher; opus 6). Consult: L'Héritier, *Notice sur le célèbre violiniste Niccolò Paganini* (Paris, 1830; Eng. trans., London, 1830); Schottky, *Paganinis Leben und Charakter* (Hamburg, 1830); Fétis, *Biographical Notice of Niccolò Paganini* (trans. from the French, London, 1871).

PAGE, Mr. In Shakspeare's *Merry Wives of Windsor*, a gentleman to whom, under the name of Brook, Falstaff boasts of his conquest of Mrs. Page and in consequence becomes a laughing-stock. Page's daughter, Anne, is in love with Fenton.

PAGE, David (1814-79). An English geologist, born at Lochgelly, Fifeshire, and educated at Saint Andrews. His parents had devoted him to the ministry, but he preferred natural science, and worked on a Fifeshire newspaper, besides doing other journalistic work, until 1843, when the Chambers Publishing Company of Edinburgh first employed him as scientific editor. He was appointed professor of geology in Durham University in 1871. Page's especial claim to fame was his ability as a popular writer on geology; he wrote many excellent text-books, such as: *Rudiments of Geology* (1844); *The Earth's Crust* (1864 and after); *Physical Geography* (1864); and elementary and advanced text-books of geology. It is probable that he contributed to *Vestiges of the Natural History of Creation*.

PAGE, David Perkins (1810-48). An American educator, born at Epping, N. H. He was educated at the Hampton Academy, and was afterwards principal of a department in Newburyport High School. In 1845 he was appointed first principal of the Albany State Normal School, a post he held until his death. His work, *Theory and Practice of Teaching, or the Motives of Good School Keeping* (1847), remains a valuable work on the subject. The edition of 1886 contains a biography by W. H. Payne.

PAGE, John (1744-1808). An American patriot, born in Rosewell, Va. He graduated at William and Mary College in 1763, sat in the Virginia House of Burgesses, and became a member of the Colonial Council. He was a member of the convention which, in 1776, framed the Constitution of Virginia; at one time was colonel of a militia regiment; was appointed one of the first councilors; was a member of the Committee of Public Safety; and was Lieutenant Governor of the State. In the course of the war he contributed a large part of his very considerable private fortune to aid the Patriot Party. He was a member of Congress from 1789 to 1797, and in 1802-05 he was Governor of Virginia. Subsequently, until his death, he was commissioner of loans for this State.

PAGE, Thomas Jefferson (1808-99). An American naval officer, born in Gloucester County, Va. He was appointed a midshipman in 1827, and became lieutenant in 1839, and commanded the *Dolphin* against the Chinese pirates. From 1853 to 1860 he was engaged in making surveys of South American rivers. In 1855 he had reached the rank of commodore, but upon the secession of Virginia, resigned from the United States service. He declined the rank of admiral in the Italian Navy, and commanded the Confederate batteries at Gloucester Point, York River, Virginia. He was made commodore in 1862, and was sent to England to superintend the building of two powerful rams on the Mersey, but these were seized by the British Government on the protest of Charles Francis Adams, the United States Minister. In January, 1865, a small ironclad, built for the Confederacy, was commissioned at Copenhagen and called the *Stonewall*. In this he cruised for some time after the collapse of the Confederacy, but turned her over to the Governor General of Cuba in return for $16,000 to pay the crew. Afterwards he engaged in cattle and sheep raising in the Argentine Republic and superintended the building of four gunboats for the navy of that country. The last twenty years of his life were spent in Florence, Italy. He published *La Plata: the Argentine Confederation and Paraguay* (1859).

PAGE, Thomas Nelson (1853—). An American novelist. He was born of old Virginian stock in Oakland, Hanover County, Va. He graduated

Washington and Lee University and studied at the University of Virginia. He practiced for some years in Richmond, Va., then after a second marriage moved to Washington, D. C., where he continued to live. Aside from some dialect poetry, his first noteworthy literary venture was the tale *Marse Chan*, published in the *Century Magazine* in 1884, and incorporated, with *Meh Lady* and other stories, in the volume entitled *In Ole Virginia* (1887). This was followed by *Two Little Confederates* (1888); *Befo' de War*, a collection of his early poems together with poems by A. C. Gordon (1888); *On Newfound River* (1891); *Elsket* (1891); *The Old South*, a volume of essays (1892); *Pastime Stories* (1894); *Red Rock* (1898), a novel of the Reconstruction period; and *Gordon Keith* (1903). These stories, with very few exceptions, deal with Virginia, present negro character, and are noted for the faithfulness and sympathy with which they depict the courtesy, courtliness, and high spirit of the aristocracy of that State just before, during, and after the Civil War.

PAGE, William (1811-85). An American portrait and historical painter. He was born at Albany, N. Y., and in 1819 moved with his parents to New York City. He first studied with S. F. B. Morse, through whom he entered the Academy of Design. From 1828 to 1830 he studied theology at Andover and Amherst, but, returning to art, he took up portrait painting at Albany, and later at New York, where, in 1836, he was made National Academician. His works of this period include portraits of Governor Marcy for the New York City Hall, and John Quincy Adams for Faneuil Hall, Boston; "The Holy Family," Boston Athenæum; "The Infancy of Henry IV.;" and others. In 1849 he went abroad, residing at Rome and Florence, where he made many fine copies of Titian and painted his celebrated "Venus," the "Flight Into Egypt," the "Infant Bacchus," besides portraits of Robert and Elizabeth Browning and others. In 1860 he returned to New York, and in 1871-73 was president of the Academy of Design. He afterwards painted portraits of Henry Ward Beecher, Wendell Phillips, Charles P. Daly, James Russell Lowell, and General Grant. He published a *New Geometrical Method of Measuring the Human Figure* (New York, 1860).

PAGÈS, pä'zhĕs'. See Garnier-Pagès.

PAGET, pāj'ĭt, Sir George Edward (1809-92). An English physician and reformer of medical education, born at Great Yarmouth, Norfolk. He studied at Charterhouse School and at Gonville and Caius College, Cambridge, and got his medical education at Saint Bartholomew's Hospital and in Paris. He practiced in Cambridge, and in 1842 his suggestion of bedside examinations for medical students was adopted by the university. Paget represented Cambridge in the General Council of Medical Education (1863 sqq.) and served as its president (1869 and 1874). For the last score of years of his life he was regius professor of physic in Cambridge. Paget wrote little besides papers for the *Lancet*, the *British Medical Journal*, and the *Edinburgh Medical Journal*.

PAGET, Henry William. See Anglesey, First Marquis of.

PAGET, Sir James (1814-99). An English surgeon and pathologist, born at Yarmouth. He became apprenticed there to Charles Costerton, a practitioner, from whom he gained the rudiments of medical knowledge. Having finished his apprenticeship, Paget, in 1834, entered Saint Bartholomew's Hospital, London, where he distinguished himself in his first year by discovering the *Trichina spiralis*. At the end of his second year he carried off all the honors. He was soon made curator of Saint Bartholomew's Hospital Museum, and in 1839 demonstrator in the hospital. In 1842 he undertook an immense task which resulted in the publication of the *Descriptive Catalogue of the Pathological Specimens Contained in the Museum of the Royal College of Surgeons* (London, 1846-49). He prepared a similar catalogue for Saint Bartholomew's Hospital Museum. From 1847 to 1852 he was professor of anatomy at the College of Surgeons, and during this period delivered the famous lectures on surgical pathology which gave him a wide reputation. He became surgeon to Saint Bartholomew's Hospital in 1861; he was also made sergeant-surgeon to the Queen, surgeon to the Prince of Wales, and in 1871 was made a baronet. His chief works, besides the *Descriptive Catalogue*, were his *Lectures on Surgical Pathology* (London, 1863), which were for many years the standard text-book in England and the United States.

PAGET, Violet (pen-name Vernon Lee) (1856—). An English author, who in 1871 settled in Italy. From her we have several novels and many brilliant essays on art and literature. Among her publications are: *Studies of the Eighteenth Century in Italy* (1880); *Belcaro*, a volume of essays (1881); *The Prince of the Hundred Soups*, a fairy tale (1883); *Ottilie, an Eighteenth Century Idyll* (1883); *Euphorion*, a collection of essays (1884); *Miss Brown*, a novel (1884); *Baldwin*, philosophical dialogues (1886); *A Puppet Show* (1889); *Hauntings* (1890); *Vanitas* (1892); *Althea* (1893); *Renaissance Fancies* (1895); *Limbo*, a volume of essays (1897); *Genius Loci* (1899).

PAGGI, pä'jē, Giovanni Battista (1554-1627). An Italian painter, born in Genoa. He was a pupil of Luca Cambiaso, and lived in Florence twenty years, painting for the Medici. His best works in Florence are "Saint Catharine of Siena," in Santa Maria Novella, and the "Transfiguration," in San Marco. In 1600 he returned to Genoa and there became one of the most noted of the Genoese school. His two pictures in San Bartolommeo, and his "Massacre of the Innocents" in the Palazzo Doria, are good examples of his graceful treatment of sacred subjects. He is less successful as a colorist.

PAGO'DA (Sp. *pagoda*, from Pers. *butkadah*, idol temple, pagoda, from *but*, idol + *kadah*, temple; Chinese, *peh-kuh-t'a*, *poh-kuh-t'a*, white bone tower, *pao-t'a*, precious tower, *t'a*, tower, pile). A temple of Eastern Asia, or part of a temple, and generally a tower-like mass of many stories. As the term is European and applied to a non-European building, and as it is in careless popular use without exact significance, it can be said only that the idea generally conveyed by it is that of an Eastern religious tower. Thus an accurate writer describing Buddhist temples in Japan will speak of the hondo or temple proper, the gateway building, and the pagoda; but the

word 'pagoda' is not Japanese. These buildings in Japan are always of wood.

In the magnificent stone-built Buddhist temples of India the pagoda is generally a pyramidal structure raised above a gateway, or above the inner sanctuary; just as in a Christian church there may be a tower at the west end, or one over the crossing, or both. These Indian pagodas are among the most splendid buildings of pure monumental design in the world. The term is also applied to the tope or stupa; but this is clearly unnecessary and should be avoided. See TOPE.

In China a pagoda is often a memorial building and not connected with a temple or a monastery. The most common form is an octagonal tower of many stories, with curved roof, and a piece of roof like that of a veranda surrounding each story. Most Chinese pagodas are built of brick, with no very great architectural pretension, but they are effective in outlines, and their great number in certain parts of the Empire adds a peculiar charm to the landscape. But little archæological and critical study has been given to them (see CHINESE ART), and the books of recent travelers illustrated with specially taken photographs have added very greatly to our understanding of the great number and variety of them which exist in many of the provinces. Consult the authorities mentioned under CHINESE ART.

PAGO-PAGO, päng'ō-päng'ō, or **PANGO-PANGO.** A splendid natural harbor on the south coast of Tutuila (q.v.), the chief of the Samoan Islands (Map: Australasia, L 4). It was ceded to the United States in 1872 for a naval and coaling station, and during the imbroglio over the local kingship in 1898 was occupied by a United States naval contingent. By the Anglo-German agreement of 1899, it came under the protection of the United States with part of the Samoan group in 1900.

PAHANG, pä-häng'. The largest of the Federated Malay States (q.v.), situated on the eastern coast of the Malay Peninsula and bounded by the independent native States of Kelantan and Trengganu on the north, the China Sea on the east, the States of Negri Sembilan and Johor on the south, and the protected States of Perak and Selangor on the west (Map: Burma, D 6). Its area is officially estimated at 14,000 square miles. It is a thickly wooded and partly mountainous region traversed by the shallow Pahang River, which is formed by the confluence of the Jelai and the Tembeling. The coast is mostly sandy and indented at the mouths of the rivers, which are accessible only during high tide. The climate is cooler than on the western coast and the soil well adapted for agriculture. The State is noted for its gold deposits, which are successfully worked by European mining companies, electricity being used as the motive power. Tin lodes are extensively worked along the Pahang River. The Malays are chiefly engaged in agriculture, while for mining Chinese are mostly employed. The financial condition of the State is unsatisfactory, but the revenue is gradually increasing. While Pahang is the largest of the Federated Malay States in area, it is the least populated. The census of 1901 gives the population as 84,113, including 134 Europeans, Americans, and Australians, 73,462 Malays and other natives (including 7340 aborigines), 8695 Chinese, and 1227 Tamils and other natives of India. A British resident was first appointed to the Sultan of Pahang in 1888, and the State joined the Federation in 1895. The seat of administration is Kuala Lipis.

PAHARIA, pä-hä'rē-ä. An alternative name for the Mâler, of the Rajmahal Hills in Bengal, one of the northern Dravidian peoples. Farther south in the same region dwell the Mal-Paharias, whose affinities are not very clear. One of the sections of the population of Nepal, speaking a neo-Aryan dialect, is also called Paharia. Some account of the Dravidian Paharia will be found in Dalton, *Descriptive Ethnology of Bengal* (Calcutta, 1872), and the works of a general character relating to the Dravidian peoples. See DRAVIDIANS.

PAHLANPUR, pä'lân-pōōr'. A native State of India. See PALANPUR.

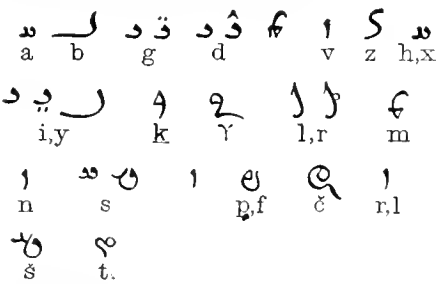
PAHLAVI (pä'lä-vē) **LANGUAGE AND LITERATURE** (from Pers. *Pahlav*, hero, name of a district about Ispahan, from OPers. *Parθava*, Parthia; cf. Skt. *Pahlava*, Persian). The language and literature of the middle Persian period, extending from the third to the ninth or tenth century A.D. The language is closely akin to Old Persian (q.v.) and Modern Persian (see PERSIAN LANGUAGE), although it stands far nearer to the latter than to the former. In its phonology Pahlavi in the main agrees with modern Persian. The principal divergencies are as follows: Original initial *a*, lost in Persian, is still found in Pahlavi, as Pahlavi *anumīd*, Persian *umīd*, 'hopeless,' Pahlavi *anāk*, Persian *nāk*, 'evil;' the diphthongs *ē* and *ō* (Indo-Iranian *ai*, *au*, Sanskrit *e*, *o*, Avesta *aē*, *aō*) are retained unchanged in Pahlavi, except that in the later period before *m* and *n* they become *ī*, *ū*, while in Persian they are changed to *ī* and *ū* throughout, as Avesta *daēva*, Pahlavi *dēv* (cf. the Armenian loan-word *dew*), 'demon;' Avesta *yaōsh*, Pahlavi *rōz* (cf. the Armenian loan-word *rocik*, 'daily bread'), Persian *rūz*, 'day;' but Avesta *daēna*, Pahlavi *dēn* (cf. the Armenian loan-word *den*), *dīn*, Persian *dīn*, 'creed;' Avesta *haoma*, Pahlavi, Persian *hūm*, 'sacred plant;' original intervocalic *k* and *p* are retained in Pahlavi, but become *g*, *d*, and *b* or *v* in Persian, as Old Persian *bandaka*, 'slave,' Pahlavi *bandakān*, Persian *bandagān*, 'slaves;' Old Persian *api*, Pahlavi *āp*, Persian *āb*, 'water;' Old Persian *niyapišam*, 'I wrote,' Pahlavi *nipištan*, Persian *nivištan*, 'to write;' initial *v* remains unchanged in Pahlavi, but in Persian becomes *b* or *g*, as Old Persian *vasiy*, Pahlavi *vas*, Persian *bas*, 'much;' Avesta *vazra*, Pahlavi *vas*, Persian *bas*, 'much;' Iranian *s* is retained in Pahlavi, but becomes *h* in Persian, as Avesta *kasu*, Pahlavi *kas*, Persian *kah*, 'small.'

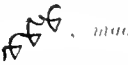
Like modern Persian, Pahlavi has lost all the nominal inflections excepting the plural ending, as *rūbān*, 'soul,' plural *rūbānān*, and the *ī* or *izāfat* which serves to express the genitival and adjectival relations, as *granāk-ī ātaš*, 'heat of the fire;' *zan-ī pagāhar*, 'nobly born wife.' The other case relations are expressed by prepositions, as *ō ōy gōft*, 'he said to him;' *mahīst pa tanō*, 'greatest in body;' *frafām mēn marahān*, 'first of men.' Plural adjectives in Pahlavi receive no termination unless they are employed as substantives, and then, as a rule, only if there is no accompanying word to show the plural, as *darvandān*, 'wicked (men),' but *hamāk ān ī*

buland kōf, 'all the high mountains,' while the attributive adjective is invariable, as *niāk būdand*, 'they are good.' The comparative and superlative degrees are formed by *-tar*, and *-tām* or *-ist* respectively, as *hūp*, 'good,' *hūptar*, 'better;' *tag*, 'brave,' *tagatūm*, 'bravest;' *kam*, 'few,' *kamist*, 'least.' The pronouns and numerals do not differ essentially from those found in modern Persian. The conjugation is very simple. The active voice alone remains, the passive being periphrastic in its formation. The moods are indicative, imperative, subjunctive (corresponding to the modern Persian precative), and potential (corresponding to the Old Iranian optative), besides a present, a past, and a future participle, and an active infinitive. The old tenses are the present and preterite; the other tenses, perfect, pluperfect, future perfect, present and perfect conditional, and perfect subjunctive, are periphrastic. The inflection of the verb is almost the same both in Pahlavi and in modern Persian, as may be seen from the following comparative table of the present Pahlavi *darīdanō*, and Persian *darīdan*, 'to tear:'

	Pahlavi.	Persian.
Singular	*darēm*	*daram*
	darē	*darī*
	darēd	*darad*
Plural	*darēm*	*darīm*
	darēd	*darīd*
	darēnd	*darand*

From the grammatical sketch just given one might reasonably infer that Pahlavi was one of the easiest of languages. On the contrary, it presents two problems of great difficulty. These are the alphabet and the Semitic forms which abound in the literature, which, though simple if the script were adequate, are often rendered extremely doubtful on account of the meagre alphabetical system. The Pahlavi alphabet, which is read from right to left, is based on an Aramaic script, and is closely related to that of the Avesta (q.v.). There are two varieties, the Chaldæan Pahlavi, used only in two of the oldest inscriptions in the language, and the Sassanian Pahlavi, which became with some modifications the literary script, the so-called Book-Pahlavi. This latter alphabet is as follows:



The ambiguity of these single characters is complicated by the ligatures, as  , *am*, *ām*, *hm*, *xm*,  , *madamam*,  , *ahū*, *axū*, *āān*, *āhū*, *ahn*, *āxū*, *hār*, *hān*, *xān*, *zdān*, *čšra*, *išn*, *dahišn*, *īyār*, *īyān*, *īkūn* or *īgān*, *sān*, *yčhō*, etc., of which there are a little more than a hundred, many of which admit of several different readings. The fact must be emphasized, however, that the ambiguity is not so great as it seems at first sight. Since the alphabet is Semitic, the vowels are not written, for initial *a* is a consonant in Semitic grammar, although *ī* and *ū* may be denoted, as in the Aramaic alphabet, by *y* and *r*. The Semitic words give a peculiar aspect to Pahlavi. They are not loan-words, as is the case with the Arabic element in Persian, but seem to have been logograms, i.e. Semitic words were written, but Iranian words were pronounced. This may not only be inferred from the statement of Ammianus Marcellinus that Shapur II. (c.309-c.379) was called *Saunsaan* (i.e. *Shāhān-Shāh*, Old Persian *xšāyaθiya xšāyaθiyānām*, 'king of kings'), although his coins bear the Aramaic equivalent, *malkān malkā*, but it is stated positively by Ibn Mukaffa, who flourished about the middle of the tenth century. He says that in their spelling, called *Zarārišn*, one wrote for 'meat' the Aramaic *bisrā*, but read for this logogram the Iranian equivalent *gōšt*, and in like manner for 'bread,' one wrote the Aramaic *lahma*, but read for it the Iranian *nān*. The Pahlavi which contains both Iranian words and Aramaic logograms is called Huzvaresch (Pahlavi *Āūzvarišn*, Persian *Zvārīš*, *Uzvārīš*, *Uzvārišn*). The meaning of this term is uncertain, but of the many explanations which have been advanced, that which connects the word with the Avesta *zbar*, 'to be distorted,' from which the Arabic verb *zavvara*, 'to conceal, distort, falsify, deceive, trick, mislead,' has been borrowed, seems quite probable. If this etymology is correct, the term seems to have been employed on account of the disguise of the Iranian words by the Aramaic logograms. Another plausible etymology connects the name with the obsolete Persian *zuvārīdan*, 'to be old or worn out,' in allusion to the archaic Persian found in Pahlavi as compared with the modern language. There is a native lexicon, known as the *Sassanian Frahāng* or *Frahāng-i Pahlavīy*, which gives a list of about 1300 Semitic logograms with their Iranian equivalents. The difficulties of Huzvaresch led at a later period to a transcription from the Pahlavi characters. The Semitic logograms were then omitted, and in their stead their Iranian equivalents were written. The term applied to this Iranized Pahlavi is Pazend or Parsi, although usage differs somewhat, as some authorities call the texts Pazend and the language Parsi, while the more common and better distinction defines the transcription in Avesta letters as Pazend, while that in Persian and Gujarati script is called Parsi.

The correct forms of Pahlavi words are often problematical on account of the inadequate alphabet, and the traditional readings of many of them are certainly incorrect. The common means of determination by comparison with Avesta and Persian cognates, with the Aramaic equivalents of the logograms, and with the numerous Armenian loan-words from Middle Persian, often renders a fairly accurate restoration of the original form of the Pahlavi words possible.

Pahlavi literature is of considerable extent, although its literary value is slight. It may be divided into three classes—Pahlavi translations, intermingled with commentary, of the Avesta, texts on religion, and treatises on miscellaneous

subjects. Of the first class the most important published texts are the *Pahlavi Vendidād*, *Yasna*, and *Vispered*, the *Hāṭōxt Nask*, the *Aogemadaēčā*, the latter two dealing mainly with eschatological subjects and with death, and the *Frahang-ī Oīm-aēvak*, a dictionary of (Iranian) Pahlavi words, with their Avesta equivalents. Of the Pahlavi texts on religion, the principal are the *Dīnkart*, a large work of which six books have been preserved, treating of Zoroastrian customs, doctrines, and literature; the *Būndahisn*, which gives the Iranian cosmogny; the *Dātistān-ī-Dīnīk*, a series of replies to ninety-two inquiries on religious questions; the *Šikand-gūmānīg Vijār* (of which only the Pazend text and a Sanskrit translation are thus far known), a most important source for a knowledge of Zoroastrian philosophy, and of interest also for its criticisms of Christianity, Manichæism, and Mohammedanism; the *Šāyast-lā-šāyast*, on the duties of Zoroastrians and the dangers which beset them; the *Dīnā-ī-Maīnōg-ī Xrat*, being the answers of the 'Spirit of Wisdom' to seventy-two inquiries concerning the faith; the eschatological treatises of the *Artā-ī-Vīrāf Nāmak* and the *Bahman Yast*; and the *Mātīgān-ī Yōšt-ī Fryānō*, containing Yosht's replies to thirty-three riddles propounded to him by the wizard Akht, whom he answers and destroys. The third division has as its most important texts the *Yātkār-ī Zarīrān*, a history of the war resulting from Zoroaster's conversion of Vishtaspa (see ZOROASTER), the historical romance of the *Kārnāmak-ī Artaxšīr-ī Pāpakān*, and a geographical treatise, the *Satrōīhā-ī-Aīrān*, which describes about a hundred cities in Iran.

BIBLIOGRAPHY. Spiegel, *Grammatik der Pārsi-Sprache* (Leipzig, 1851); id., *Grammatik der Huzvâresch-Sprache* (Vienna, 1856); Sanjana, *Grammar of the Pahlavi Language* (Bombay, 1871); Harlez, *Manuel du Pehlevi* (Paris, 1880), the most convenient handbook for beginning the study of the language; Darmesteter, *Études Iraniennes*, vol. i. (ib., 1883); Salemann, "Mittelpersisch," in Geiger and Kuhn, *Grundriss der iranischen Philologie*, vol. i. (Strassburg, 1901); Spiegel, *Traditionelle Litteratur der Parsen* (Vienna, 1860); West, "Pahlavi Literature," in Geiger and Kuhn, *Grundriss der iranischen Philologie*, vol. ii. (Strassburg, 1896); Jamasp Asana, *Pahlavi, Gujarâti, and English Dictionary* (Bombay, 1877 et seq). The most important editions and translations of Pahlavi texts are as follows: West, "Pahlavi Texts," in Müller, *Sacred Books of the East*, vols. v., xviii., xxiv., xxxvii., xlvii. (Oxford, 1880-97), a set of translations invaluable for Iranian scholars; Spiegel, *Avesta, die heiligen Schriften der Parsen, sammt der Huzvaresch-Uebersetzung* (Vienna, 1853-58); Mills, *Gâthâs* (Oxford, 1894); Darmesteter, "Nirangistan," in *Le Zend-Avesta*, vol. iii. (Paris, 1893); Sanjana, *Nirangistan* (Bombay, 1894); Hoshang and Haug, *Old Zand-Pahlavi Glossary* (ib., 1867); Reichelt, *Frahang-ī Oīm* (Vienna, 1900); Hoshang and Haug, *Old Pahlavi-Pazand Glossary* (Bombay, 1870; this contains also Haug's important "Essay on Pahlavi"); Geiger, *Aogemadaēčā, ein Parsentractat in Pâzend, Altbaktrisch und Sanskrit* (Erlangen, 1878); Peshotan, *Dinkard* (Bombay, 1874 et seq.); Justi, *Bundehesch* (Leipzig, 1868); Hoshang and West, *Šikand-gūmānīk Vijār* (Bombay, 1887); Andreas, *Book of the Mainyō-i Khard* (Kiel, 1882); West, *Book of the Mainyō-i-Khard* (Stuttgart, 1871); Haug and West, *Book of Arda Viraf . . . Gosht-i Fryano, and Hadokht Nask* (Bombay, 1872; this contains also a valuable table of Pahlavi ligatures and an outline of the grammar by West); Jamasp Asa, *Arda Viraf Nameh* (Bombay, 1902); Barthélemy, *Gujastak Abâlis, relation d'une conférence théologique* (Paris, 1887); Peshotan, *Ganje shayagân, Andarze Atrepât Mârâspandân, Mâdigâne Chatrang, and Andarze Khusroe Kavâtan* (Bombay, 1885); Sheriarjee Dadabhoy, *Pandnâmeh-i Aderbad Mârasfand* (ib., 1869); Noldeke, "Geschichte des Artachsîr-i Pâpakân, aus dem Pehlewi übersetzt," in Bezzenberger, *Beiträge zur Kunde der indogermanischen Sprachen*, vol. iv. (Göttingen, 1878); Modi, *Aiyadgâr-i-Zarîrân, Shatrôihâ-i Airân, and Afdiya va Sahigiya-i Sistan* (Bombay, 1899); id., *Mâdigân-i Hazar Dâdistân* (ib., 1901).

PAHLEN, pä'len, PETER LUDWIG (1745-1826). A Russian general best known as one of the murderers of the Emperor Paul I. (q.v.). Entering the military service at an early age, he fought in the wars against the Turks and participated in the storming of Otchakov in 1788. In 1790 he became lieutenant-general, three years later was made Governor of Livonia, and in 1795 of Courland. He was raised to the rank of count in 1799 and in the following year became head of the ministerial council. After taking a leading part in the conspiracy which brought about the death of Paul I. (March 23, 1801) he continued for some time in the service of Alexander I., but retired in 1804.

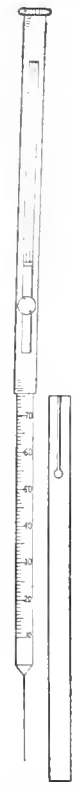
PAILA, pī'lā. A Hindu sage, who, according to the Puranas (q.v.), was a pupil of Vyasa (q.v.). When Vyasa had composed the Vedas (q.v.), he divided them into four parts, giving one to each of his four favorite pupils. In this way Paila became the teacher of the Rig-Veda, Vaiśampayana of the Yajur-Veda, Jaimini of the Sama-Veda, and Sumantu of the Atharva-Veda, while the Itihasas and Puranas, also composed by Vyasa according to Indian tradition, were intrusted to Romaharshana. Consult Muir, *Original Sanskrit Texts*, vol. iii. (London, 1868).

PAILLERON, pä'ye-rôN', ÉDOUARD JULES HENRI (1834-99). A French dramatist and satirist, born in Paris. He began life as a notary's clerk, but at twenty-six gained notoriety by satiric verses, *Les parasites* (1860), and a comedy, *Le parasite* (1860). With *Le monde où l'on s'ennuie* (1881) popularity became fame. This is one of the wittiest satires on fashionable literary coteries ever written and is supposed to count among its *dramatis personæ* several contemporary Parisian celebrities, notably Professor Caro. In 1882 Pailleron was elected to the Academy. He wrote a few other plays, but he never equaled the success of *Le monde où l'on s'ennuie*. *La souris* (1887) is his only other noteworthy play. Consult his *Pièces et morceaux* (1897).

PAIN (OF., Fr. *peine*, from ML. *pena*, Lat. *poena*, pain, punishment, from Gk. ποινή, *poinē*, penalty; connected with Gk. τίνειν, *tinein*, to pay, Skt. *ci*, to avenge). A term employed by psychologists of the English associationist school (see ASSOCIATION OF IDEAS) for what

termed unpleasantness (see AFFECTION), pleasure and pain being the two fundamental qualities of the affective life. But the concrete pains of everyday experience are, as even a superficial introspection shows, partly matters of sensation. "Pain (*Schmerz*) is always at once a sensation and a violent feeling of unpleasantness (*Unlustgefühl*)" (Wundt). It is therefore impossible to restrict the term to the sphere of affection.

Under the heading CUTANEOUS SENSATIONS, it is noted that pain is, as a matter of fact, a distinct and specific cutaneous quality, having as its terminal organs the free nerve-endings in the epidermis. The pain-spots are constant in position, and pain-maps can be drawn which furnish as permanent and valid records of the pain sensitivity as do the pressure and temperature maps of their cutaneous qualities. We have here, then, merely to discuss pain as an organic sensation (q.v.).



HAIR ÆSTHESIOMETER FOR PAIN AND PRESSURE SPOTS.

It was formerly supposed that pain was a common sensation, excitable by excessive stimulation of any and every sensory nerve, optic, acoustic, etc. This theory still lingers in the belief, e.g. that there are special temperature pains producible and only producible by excessive thermal stimulation of the cutaneous surface. But it found its chief support in the great variety of organic pains. There seems to be no internal organ, however insensitive during healthy function, that cannot mediate pain when the function is deranged. And the pains vary in character, according to their place or mode of origin. They may be throbbing, as in toothache; dull and gnawing, as in extreme hunger or in inflammation of the bowels; dull and throbbing, as in lesion of the rectum; acute and shooting, as in neuralgia; acute and intermittent, as in colic; acute and constant, as in peritonitis; dull and nauseating, as in certain diseases of the ovaries and testicles; pressing, boring, constricting, cutting, piercing, as in headaches; burning or smarting, as in certain skin wounds; dragging, as in certain forms of rheumatism. It is very natural — indeed, it seems at first sight necessary — to explain these differences as differences of quality; to assume the existence of many different kinds of pain. If we look at the facts more closely, however, we see that certain of the descriptive adjectives point unmistakably to simple differences of time and of intensity. A throbbing pain is an interrupted pain; a shooting pain is one that shows, besides intermittence, a quick rise of intensity as it runs its course; a piercing pain is intensive, a dull pain weaker. Moreover, all the concrete pains are intermixed with the specific sensations (pressure, various organic qualities) peculiar to the organs which mediate them: a sickening pain contains the sensation of nausea, a dragging pain contains a mass of muscular sensations. These concomitant sensations, again, are variously localized: an acute pain seems to occupy a small area, a dull pain is massive, wide-spread. When we take these facts into account, and remember the specific differences to which variations of time and intensity may give rise in conscious complexes other than pains, we shall hardly resist the conclusion (suggested also by introspection) that the pain quality is one and the same throughout. There is one pain; there are many pains. The many pains differ temporally, intensively, and in their associations; not qualitatively. The organ of this organic pain quality must then be looked for in the muscle substance; but whether it consists of a free nerve-ending, like the pain-ending of the epidermis, we do not know. Consult: Titchener, *Experimental Psychology* (New York, 1901); Wundt, *Physiologische Psychologie* (Leipzig, 1893).

MACDONALD'S TEMPORAL ALGOMETER.

PAIN, BARRY (?—). An English author. He was educated at Cambridge, was an army tutor at Guildford, and in 1890 removed to London. He succeeded Jerome K. Jerome as editor of *To-Day*, in 1897. Pain is at his best as a parodist and fantastic humorist. He wrote: *In a Canadian Canoe* (1891); *Playthings and Parodies* (1892); *Stories and Interludes* (1892); *Graeme and Cyril*, a juvenile (1893); *Wildmay, and Other Stories of Women* (1898); *Eliza* (1900); and *Another English Woman's Love Letters* (1901).

PAINE, CHARLES JACKSON (1833—). An American soldier and sportsman, born in Boston. He graduated at Harvard in 1853, and made a considerable fortune in railroad enterprises. In 1861 he entered the Federal service as a captain in the Twenty-second Massachusetts. The next year he was sent to Ship Island, Miss., and in October was commissioned colonel of the Second Louisiana Volunteers, a negro regiment. During the siege of Port Hudson (May 24-July 8, 1863), he commanded a division. On March 4, 1864, he resigned, but the following July again entered the service as a brigadier-general, and on September 29th led a division of negro troops at Newmarket, Va. On January 15, 1866, he was brevetted major-general of volunteers. During his later years he took a great interest in yachting and built, or helped to build, the *Puritan*, the *Mayflower*, and the *Volunteer*, each of which successfully defended the *America's* Cup against a British challenger.

PAINE, JOHN ALSOP (1840—). An American archæologist, born in Newark, N. J., and educated at Hamilton College and at Andover Theological Seminary. He left the ministry to take up botanical work for the Board of Regents of New York State (1862), was two years professor of natural science at Robert College, Constantinople (1867-69), and acted as archæologist to the first expedition in the country east of the Jordan, sent out by the Palestine Exploration Society in 1872. He became curator of the

Metropolitan Museum of Art, New York City, in 1889.

PAINE, JOHN KNOWLES (1839—). An American composer, born in Portland, Me. His most important home teacher was Kotzschmar at Portland, after which he went to Berlin, where he studied organ and counterpoint under Haupt, singing under Fischer, and instrumentation under Wieprecht. Returning to Boston in 1861, he settled there as an organist, and gave organ concerts in various cities. In 1862 he taught music at Harvard, and in 1876 was raised to full professor, and the first chair of music in an American university was created. His early compositions belong to the strictly classical school, of which he was for years an unyielding adherent, but his later works lean toward the romantic school. His works include: mass in D (1867); *Saint Peter*, oratorio (1873); *Centennial Hymn* (1876); music to *Œdipus Tyrannus*, of Sophocles, for male voices and orchestra (1881), considered by many to be his masterpiece; *The Realm of Fancy*, cantata for soprano solo, chorus, and orchestra (1882); *Phœbus, Arise*, cantata for tenor solo, male chorus, and orchestra (1882); *The Nativity*, cantata (1883); *Song of Promise*, cantata (1881); symphony in C minor (1876); *Spring*, symphony (1880), in which the first indications appeared of his conversion to the romantic school; overture to *As You Like It* (1878); overture to *The Tempest* (1877); duo concertante for violin and violoncello (1878); *An Island Fantasy*, symphonic poem (1888); chamber and pianoforte music, songs and part songs, and compositions for the organ.

PAINE, MARTYN (1794-1877). An American physician. He was born in Williamstown, Vt., and in 1813 graduated at Harvard. He was one of the founders of the University Medical College (1841) (now the medical department of New York University), where he was a professor from 1841 to 1867. Among his works the best known are: *Cholera Asphyxia at New York* (1832); *Medical and Physiological Commentaries* (1840-44); *Institutes of Medicine* (1847); and a *Review of Theoretical Geology* (1856).

PAINE, ROBERT TREAT (1731-1814). An American lawyer and patriot, one of the signers of the Declaration of Independence. He was born in Boston, Mass., graduated at Harvard in 1749, and then taught school and studied for the ministry, acting as chaplain of the Northern troops in 1755. He subsequently studied law, and in 1759 was admitted to the bar. In 1768 he was a delegate to a convention called by prominent citizens after Governor Bernard had dissolved the Legislature for refusing to rescind its circular letter to the other colonies, and in 1770 he managed, in the absence of the Attorney-General, the prosecution of Captain Preston and his men for firing upon the citizens on March 5th. (See BOSTON MASSACRE.) In 1773-74 he was a member of the Massachusetts Assembly; was one of the representatives of Massachusetts in the Continental Congress from 1774 to 1778; and was a signer of the Declaration of Independence. He was Speaker of the Massachusetts House of Representatives in 1777; helped draft the new State Constitution in 1779; was Attorney-General of the State from 1780 to 1790; and was an associate justice of the Massachusetts Supreme Court from 1790 to 1804, when he resigned on account of deafness. Besides being an able lawyer, he was well known for his scholarly attainments, and in 1805 received the degree of LL.D. from Harvard. He was one of the founders (1780) of the American Academy of Arts and Sciences.

PAINE, ROBERT TREAT (1773-1811). An American poet, son of the preceding, born at Taunton, Mass. His name was originally Thomas, which was changed in 1801 to that of his father. He was graduated from Harvard College in 1792. In 1794 he started a fortnightly literary paper called the *Federal Orrery*. For this he wrote the *Lyars* and the *Jacobiniad*, satirical poems full of personalities; these made him bitter enemies, and several times caused him to be assaulted. He then became interested in the theatre, and in 1795 he married Miss Baker, an actress. The same year, upon taking the degree of A.M., he read a poem upon *The Invention of Letters*, which brought him temporary reputation, as did also *The Ruling Passion* and *Adams and Liberty* (1798). He then took to the law, studying in Newburyport under Theophilus Parsons and practicing in Boston in 1802. The last years of his life were passed in destitution. His work is without lasting qualities.

PAINE, THOMAS (1737-1809). An Anglo-American political and philosophical writer and agitator. He was born at Thetford, Norfolk, England, January 29, 1737, the son of a Quaker. His schooling was over by the time he was thirteen, and he was then put to his father's trade of staymaking. In 1759 he established himself as a staymaker at Sandwich, Kent, and in 1762 he became an excise man. In 1765 he was discharged because he had testified to having performed certain duties which he had really neglected, and went back to his trade. In 1766 his petition for restoration was granted, but he did not take up the work again till 1768, supporting himself in the interval by teaching in London, where he also preached as a Methodist. In 1771 he kept a tobacco shop at Lewes, Sussex. In 1772 he was chosen by the excisemen to plead for an increase in their salaries, but was not successful. In 1774 he was again discharged from the excise service, this time on the ground, as officially stated, "of having quitted his business without obtaining the board's leave for so doing, and being gone off on account of the debts which he had contracted." In October, 1774, he emigrated to America with a letter from Benjamin Franklin to Richard Bache of Philadelphia, who introduced him to Robert Aitkin. He found employment as an editor for eighteen months of Aitkin' *Pennsylvania Magazine, or American Monthly Museum*. Paine entered heartily into the spirit of the times, allying himself from the first with the Patriot or Whig Party. On January 9, 1776, he published his famous pamphlet, entitled *Common Sense*, in which he argued that "government, even in its best estate, is a necessary evil," that there is no warrant or reason for "the distinction of men into kings and subjects," and that the American colonies, owing no real allegiance to the British Crown, from which they had suffered innumerable grievances, "should forthwith become independent." The pamphlet expressed with great force the views of the more radical Whig element and

a remarkable influence throughout America, and did much to win over the timid and the wavering to the side of those who advocated separation from the mother country.

In the fall of 1776 Paine enlisted in the Continental Army, and for a time was a volunteer aide-de-camp on the staff of General Greene. His military experience was brief. It prompted the first issues of *The Crisis*, a series of sixteen pamphlets, which was written by him over the signature 'Common Sense' between December, 1776, and December, 1783, and which, like his earlier pamphlet, were much read and had a powerful influence over the people. In January, 1777, Paine was appointed secretary to the commission sent by Congress to treat with the Indians at Easton, Pa., and in April he was elected secretary to the Congressional Committee of Foreign Affairs. He was virtually compelled to resign, January 8, 1779, because he had used in print information which had come to him in his official capacity. He became a law clerk, and was clerk of the Pennsylvania Assembly for a year. In 1781 he went as secretary to John Laurens, who had been sent to France on a Government mission to raise money. The two were cordially received by the King, and returned "with 2,500,000 livres in silver, and in convoy a ship laden with clothing and military stores." In February, 1782, at the suggestion of Washington, Congress granted $800 to Paine on condition that he should use his pen in support of the country. In 1784 the State of New York presented him with 277 acres of land at New Rochelle, and Pennsylvania with £500; and in 1785 Congress gave him $3000. He was thus relieved from poverty, and employed his leisure in experimentation, especially in perfecting his iron bridge, an invention of merit.

In 1787 Paine went to France, where he exhibited his bridge to the Academy of Sciences in Paris. He also visited England, and was lionized in London by the party of Burke and Fox. He set up the model of his bridge on Paddington Green, and huge crowds went to see it. But he brought himself into odium by writing in 1791 and 1792 his pamphlet *The Rights of Man*, in reply to Burke's *Reflections Upon the Revolution in France*. Notwithstanding Burke's kind treatment of him and their former friendly relations, he accused Burke of ignorance, prejudice, and blind partisanship. The English Government brought a suit against him for his attack upon the English Constitution in the second part of the *Rights of Man*, and in his absence passed a sentence of outlawry (December, 1792). Paine had already gone to France. There he was enthusiastically received. The National Assembly gave him the title of citizen (August 26, 1792), along with Washington, Hamilton, and Madison, and several departments elected him as their deputy to the French Convention. Paine accepted the election of Pas-de-Calais, and attended the sessions of the Convention. He could not speak French, and had translations of speeches read for him while he stood upon the tribune. The most important business then in hand was the deposition of the King, and Paine was courageous enough to speak and vote against his execution. He even offered him a temporary asylum in the United States. When the Girondists, with whom he acted, fell from power, he was ejected from the Convention on the ground of being a foreigner, and on December 28, 1793, was committed to the Luxembourg Prison, where he was kept for ten months. Just before his arrest he had finished the first part of his *Age of Reason*, the famous exposition of Deism, and had committed it to his friend Joel Barlow. While in prison he worked upon the second part. His release (November 4, 1794) was mainly due to the change in the government. He was unanimously restored to his seat in the Convention, and sat there until its adjournment (October 26, 1795). In the same year he attracted considerable attention by making a bitter attack upon Washington, whom he charged, among other things, with inefficiency and treachery.

Paine returned to America in 1802, and landed at Baltimore, October 30th. He found that his services in the cause of the colonies were in some quarters gratefully remembered, but that his *Age of Reason* had cost him the esteem of the religious part of the community. He suffered also from ill health, and became careless in manners and morals. He lived successively at Bordentown, N. J., at New Rochelle, N. Y., and in New York City. He died in New York, June 8, 1809, and was buried in New Rochelle, where a monument was erected to him in 1839, although his body had been exhumed and carried to England by direction of William Cobbett in 1819. As a writer Paine was forceful and original. His versatility is shown by the variety of the topics which engaged his attention. His attack upon the Bible was unscholarly and ignorant, and his defiant assertion of Deism brought him into great ill repute in his time. The best edition of his works is by Moncure D. Conway (4 vols., New York, 1894-96), who has also written his biography (ib., 1892; condensed ed. 1902). Consult, also, Tyler, *Literary History of the American Revolution* (New York, 1896).

PAINE, William H. (1828-90). An American engineer, born in Chester, N. H. He did much to improve roads and engineering methods in California in 1849, surveyed a line for a railroad from Sacramento to Utah (1853), and in 1861 volunteered in the Union Army. He served throughout the war, attained the grade of colonel, and made valuable maps. He worked under Roebling as consulting engineer on the Brooklyn (N. Y.) Bridge, and for a time superintended the entire work. The cable system on the bridge was planned by Paine; and he built and engineered cable roads in New York City, Omaha, Denver, Kansas City, and Cleveland.

PAINESVILLE, pānz'vĭl. A city and the county-seat of Lake County, Ohio, 29 miles east by north of Cleveland; on the Grand River, and on the New York, Chicago and Saint Louis, the Lake Shore and Michigan Southern, and the Pittsburg and Western railroads (Map: Ohio, il 2). It is the seat of Lake Erie College, opened in 1859, and has a public library with more than 5500 volumes. A massive stone viaduct spans the river at this point. Painesville is of considerable commercial importance, being situated but three miles from Fairport, on Lake Erie, where there is a fine natural harbor with extensive ore docks. Its industrial establishments include a grain elevator and flouring mills, foundries and machine shops, and large veneer machine and brick machine works. The waterworks and electric light plant are owned by

the municipality. Population, in 1890, 4755; in 1900, 5024.

PAINT, Luminous. See Luminous Paint.

PAINTED QUAIL. (1) The mountain quail (*Orcortyx pictus*). See Quail. (2) A small quail-like partridge of China (*Excalfactoria Sinensis*) found from India to Ceylon and Formosa. It has a plumage of varied colors, in which chestnut is conspicuous, and is much hunted. A darker race inhabits the Philippines, Malayan islands, and Australia; and similar species occur in New Britain and neighboring islands, and in Central and Southern Africa. The Australian form is called 'least swamp-quail.'

PAINTED TURTLE, or Painted Terrapin. The commonest pond turtle (*Chrysemys picta*) of the Eastern United States. It is greenish above with yellow and red markings, and yellow and brown below.

PAINT'ER, William (1540?-94). An English translator, educated at Saint John's College, Oxford. In 1560 he became clerk of the ordnance in the Tower of London. Notwithstanding his denials, he seems to have pilfered the Queen's funds. He is known for *The Palace of Pleasure* (vol. i., 1566; vol. ii., 1567), a collection of one hundred tales, translated from Latin, Greek, French, and Italian. Painter may be said to have made Bandello, Boccaccio, Cinthio, and various other Italians familiar to English readers. The collection was immensely popular and led to many similar compilations. From it the English dramatists drew freely for their plots. Consult the reprint, ed. by Jacobs (London, 1890).

PAINTER-ENGRAVER. An artist who engraves his own designs—that is, an original engraver, one occupied in expressing his artistic thoughts by means of some process of engraving, as distinguished from one who engraves the designs of others. The term is adopted from the French, *peintre-graveur*. Albrecht Dürer was very eminent as a painter-engraver with the burin; Rembrandt in etching; T. M. W. Turner in mezzotint. So, among men of our own time, there may be named Gaillard, in live work, and Whistler as an etcher.

PAINTERS' COLORS. The number of colors used by painters in their art has greatly varied. Until the time of Apelles but four were known—white, yellow, red, and black. Green, purple, and blue were discovered later. The discoveries of modern chemistry have greatly increased the number available, which are derived from the mineral, vegetable, and animal worlds. But although the painter of the present day has a long list to choose from, a dozen is quite sufficient for the richest palette. They are prepared for use by calcining and washing; oil paints are ground in poppy or linseed oil, and preserved in tin tubes. In general, colors are either opaque or transparent, the former being used for the lights, the latter for the shadows and dark portions of the picture. For the sources and character of painters' colors, consult the subdivision *Pigments* of the article Paints, and the articles on the special colors, such as Blue; Carmine; Purple Colors; Ultramarine, etc. For the quality of color in a painting, see Color.

PAINTING. In the fine arts, the representation by means of color and line upon a flat surface, of objects of nature and of the imagination. According to the flat surface used, painting may be mural, panel, easel, etc. (See Mural Decoration.) As regards the materials used the principal varieties of painting are encaustic, fresco, pastel, tempera, water color (q.v.), oil, and stereochrome. (See also Stereochromy.) According to the subjects represented, the principal varieties are figure, genre (q.v.), history, portraiture (q.v.), landscape (q.v.), animal, and still life painting. For the implements used by the painters, see Canvas; Easel; Ground. The following historical sketch is concerned chiefly with expressive rather than decorative painting, and will trace the evolution of painting in the Western world. The purely decorative arts of China, Japan, and other Oriental countries are treated under Chinese Art, etc. See also Decorative Art. Special articles will also be found on every painter of importance mentioned in the historical sketch.

ANCIENT PAINTING.

Egypt. The ancient Egyptians made large use of color in their art. All sculpture in wood, clay, or ordinary stone was painted, and even hard stones, such as granite and basalt, did not often escape coloring. On flat surfaces the Egyptian artist preferred to color a very low relief, or a slightly sunk design; and even where no sculpture was employed, the drawing and conventions were the same. There was no knowledge of the laws of perspective, and apparently no attempt to attain any real effect of depth. Objects on the same level may be drawn one above the other, or so that they overlap. Allowing for such conventions, however, the Egyptian artist shows skill in drawing, and great vivacity and naturalness in the treatment of his subject, especially in the depiction of animals or in the numerous scenes from daily life which decorate the tombs. In dealing with religious scenes, his freedom was fettered by strict conventions. Any play of light and shade was, of course, unthought of, but the Egyptian palette was well supplied with colors. The colors were prepared in fine powders and mixed with water and gum for use.

The remains of painting in Babylonia and Assyria are very scanty. The favorite method of decoration was by enameled brick, bearing figures in relief, which can scarcely be called painting in any strict sense. See Assyrian Art and Babylonian Art.

Greece. It was in Greece that ancient painting, like other forms of art, reached its highest development, in the fifth and fourth centuries B.C. Not that skillful fresco painting had not been common earlier. The fragments from Tiryns, and still more the splendid decorations from Cnossus in Crete, show that the Mycenæan Age (about 1500-1200 B.C.) possessed much of the technical skill of the Egyptian artist and far greater freedom and originality. With the fall, however, of Ægean civilization, we lose all examples of painting properly so called, though the vases (see Vase) enable us to trace the progress of drawing, and the statues and remains of buildings show how extensively color was employed as an auxiliary to the sister arts of sculpture and architecture. Indeed, this use continued throughout the classical period. See

GREEK ART.) There are traditions of Corinthian and Sicyonian painters, who drew outlines on walls or whitened tablets of clay by the aid of shadows, and indicated details by a few lines, but used only one color. There are also records of paintings which would carry back the art into the eighth century. Eumares of Athens is said to have distinguished the sexes, probably by the use of different colors, in distinction from the early monochrome artists, and Cimon of Cleonæ to have introduced correct drawing in profile, probably of the eye, and variety in the direction of the glance. These artists, who have some claim to be considered real persons, must have lived about the middle or end of the sixth century.

In the great outburst of Greek genius which followed the Persian wars, and which centred in Athens, painting rose to an equality with sculpture. This advance is directly connected with Polygnotus (q.v.) of Thasos, whom Theophrastus describes as the discoverer of the art. His works were large scenes covering the walls of public buildings, such as the "Painted Portico" at Athens and the "Lesche" of the Cnidians at Delphi. In general his subjects were mythological, but his contemporaries and fellow-workers Micon and Panænus, brother of Phidias, seem to have treated also events in recent history. At this time painting, like sculpture, is found in the service of the State for the decoration of public buildings and temples. As to the style of these artists, it is safe to say that true perspective was wanting, nor were light and shade indicated. The figures were on different levels, and there was some indication of broken ground. Polygnotus's palette, we are told, contained only black, white, yellow, and red, with which he succeeded, however, in producing a variety of shades. In spite of the flat color, Polygnotus was famed for his fine composition, dignity, and perfection of characterization, and severe, yet expressive, drawing.

The most important advance was made shortly after by the scene-painter Agatharchus of Samos, who discovered some of the applications of perspective and shading. His book on his new discoveries led the philosophers Anaxagoras and Democritus to serious investigation of the laws of perspective. The new methods were transferred from the large surfaces to panels by Apollodorus of Athens, and thus within a century the way was fairly cleared for a growth of the art beyond all that the Egyptians had achieved in three thousand years. The school which now arose, about the end of the fifth century, is commonly called the Asiatic or Ionic school, and is best represented by the two great rivals Zeuxis (q.v.) of Heraclea and Parrhasius (q.v.) of Ephesus. The former was famed for his truthful and even deceptive reproduction of nature, and the latter for his delicate drawing, but both must have been masters of chiaroscuro, if any reliance can be placed in the comments that have survived. To this school also belonged Timanthes of Cythnos, famous for the variety and depth of facial expression.

In the early fourth century B.C. the centre of painting seems to have been at Sicyon, where Timanthes lived late in life. Its founder was Eupompus, who was succeeded by Pamphilus (q.v.) and Melanthius, who laid great stress on systematic instruction, especially in drawing, which was introduced into the schools of the city. A pupil of the school, Pausias, perfected the encaustic painting (q.v.), which, however, did not drive out the old tempera (q.v.) process. How far the school had advanced in handling of light and shade may be judged from the praise given the black ox of Pausias. In the second quarter of the fourth century a school of Theban and Attic artists arose who seem to have given especial attention to pathos, and whose favorite subjects were battle pieces. The tendency away from the severe and lofty, which is found in sculpture, also manifested itself in painting, and many of these artists are also credited with genre scenes, flower pieces, and trifling subjects. In contrast to this tendency Nicias of Athens, who seems to have survived Alexander, insisted on the importance of great subjects. It seems very probable that the release of Io by Hermes, in the "House of Livia" on the Palatine Hill in Rome, is a copy of one of his works. The highest technical skill and artistic merit were claimed by the ancients for the two great masters of the younger Ionian school, Apelles of Ephesus and Protogenes of Caunus; the former famed for his grace, the latter for his painstaking, which in the opinion of some led him to weaken the spontaneity of his pictures. The paintings in the Etruscan tombs, though undoubtedly influenced by Greek models, are far too rude to serve as standards of reconstruction, and most of them are not later than the middle of the fourth century. Of more value is a sarcophagus from Corneto, now in Florence, on which is painted in tempera a wonderfully vigorous battle of the Greeks and Amazons, probably the work of an Etruscan artist of the early third century B.C., but evidently a close copy of a Greek model, which must have ranked in beauty and power little below the works of the best period.

The Hellenistic age shows in painting, as in sculpture, two tendencies. One was toward the rendering of mythical scenes, which afforded opportunity for pathetic or tragic expression, as in the famous picture of Timomachus of Byzantium, representing Medea meditating the slaughter of her children, of which some reminiscences seem preserved in Pompeian paintings. On the other hand, many painters seem to have preferred lighter themes. They also rendered the landscape with pleasure, and even experimented with effects of artificial light, as in a painting of a boy blowing a fire. Often the choice is low, and triviality, not to say sensuality, is a prominent characteristic. The walls of Pompeii furnish abundant examples of these tendencies. It is only from this late period of Hellenistic art that many works have come down to us. In Rome are the Aldobrandini marriage, a series of landscapes illustrating the *Odyssey*, and a rather poor series of panels representing victims of unnatural love, while the baths, palaces, and tombs have from time to time yielded others, many of which have now perished. Among these the first place must be given to those from the Farnesina Gardens, some of which recall the best Athenian lecythi of the fourth century. The largest number are, however, from the buried cities of Pompeii and Herculaneum, and of especial value are the portraits of the second century A.D., discovered in the Fayum, Egypt, where they were used to cover the faces of mummies.

ROMAN PAINTING. A mere appendix to the

Greek, Roman painting developed little originality, and, being decorative in character, will be found treated under ROMAN ART.

MEDIEVAL PERIOD.

The painting of the Middle Ages is, in the main, decorative and dependent upon architecture. (See CHRISTIAN, BYZANTINE, ROMANESQUE, and GOTHIC ART.) It exercised little influence upon the general development of painting except during the Gothic period in Italy.

ITALY. In the free cities of Italy, especially in those of Tuscany, Gothic painting reached its highest development. Here Gothic architecture was purely decorative in character, and left large wall surfaces which afforded ample opportunity for paintings. The technique used was fresco (q.v.). About the middle of the thirteenth century a number of painters in different parts of Italy began to modify, though at first slightly, the Byzantine manner. The most important of these painters was Cimabue at Florence (died after 1302), who displayed a leaning toward the Gothic, which took the form of a slight naturalism. He painted the draperies less rigid, and put more expression in the faces and life in the movements of the figures.

By far the greatest progress before the Renaissance was made by Giotto (1266-1337) at Florence. It is generally accepted that he was a pupil of Cimabue, although late authorities maintain that his art is related to that of Pietro Cavallini. The faces are still typical, rather than individual, but they are strong and the figures are dramatic in action and very characteristic. The drapery is no longer stiff, but falls in broad masses, showing the movement of the body beneath. The accessories, such as animals, landscape, and architecture, are symbolic, and conceived in a decorative sense, as is indeed the entire composition. The scale of color was limited and determined by decorative harmonies, the method being to fill in the outlines with color. What most impressed contemporaries was his great step toward naturalism. By none of his immediate followers was real progress made. By far the most important was Andrea Orcagna (d. 1368), who, in his startling frescoes and altar-pieces in the Strozzi Chapel, Santa Maria Novella, Florence, surpassed Giotto in depicting the human figure, and in the treatment of light and shadow, and even had an elementary knowledge of perspective, anticipating the discoveries of the Renaissance.

Contemporary with the Florentine, there flourished at Siena a school which retained more of the Byzantine character. (For its chief characteristics, see SIENESE SCHOOL OF PAINTING.) Duccio, its real founder, was, on the whole, a more finished painter than his contemporary, Cimabue. He perfected the hands and feet, and gave a sweet, tender expression to the long Byzantine face. Among his successors the greatest progress was made by Simone Martini (d. 1344), who strengthened the type by rounding it and adding emphasis of expression. The most important Sienese artists of the following generation were the brothers Lorenzetti (middle of fourteenth century), whose works show a strong intellectual grasp and forceful methods.

At Rome, during the Gothic period, some good mosaics were produced, but no painting. (See MOSAIC.) Elsewhere in Italy the manner of Giotto prevailed throughout the fourteenth century, even in Naples and the South, but none of these local schools were important except those of Verona and Padua, where schools, inspired by the work of Giotto in the Arena Chapel, arose. The most important master of this region was Altichiero da Zevio of Verona, who worked conjointly with Jacopo Avanzi. Their works have all the seriousness and depth of Giotto's, but without his pathos; they are not so vehement in action, but softer and more tender in emotion.

As *Transition Painters* we may classify other Italian painters of the fifteenth century, who are nevertheless Gothic in sentiment and technique. The art of Fra Angelico (1387-1455) is distinguished for devout religious sentiment, in which last respect it has never been excelled. His younger contemporary, Gentile da Fabriano, who belonged rather to the Sienese school, produced an art rich in color and detail, and he seems to have been the first to show the effect of sunlight upon landscape.

THE RENAISSANCE (1400-1600).

Renaissance art was not altogether a revival of the antique, although this was one of its essential features, especially in Italy. It was equally a revival of natural truth, especially in painting. As no antique paintings survived, the painter was compelled to go directly to nature for inspiration, unlike the sculptor, whose models were the statues of antiquity. In Northern Europe not even statues survived, and nature was the only guide. Here the Renaissance took its earliest and simplest form, spreading to Germany, France, and Spain, during the fifteenth century. Almost contemporaneously a more important development had taken place in Italy, which during the latter fifteenth century began to make itself felt in France and Spain, and during the sixteenth, replacing the Flemish influence, became dominant in Europe. Our method of treatment is suggested by the development just outlined. The period naturally falls in three divisions—the Early Renaissance, corresponding, roughly speaking, with the fifteenth century; the High Renaissance (c.1500-50); and the Decline (c.1550-1600), during which period Italian art predominated throughout Europe.

EARLY RENAISSANCE. Under the patronage of the Court of Burgundy, and of the rich burghers of the Netherlands, a school of painting arose during the latter fourteenth century, which appears highly developed in Flanders in the art of Huybrecht and Jan van Eyck (d. 1440). In their works, the most important of which is the Ghent altarpiece, we find already solved some of the chief problems of painting—a fine color, bright, but in a low key; an aërial perspective, with true rendering of atmosphere, and of light and shade. For the first time the landscape is used as a background to give sentiment to the picture, and to promote its unity, which is somewhat interfered with by the highly detailed finish. More startling still is the uncompromising naturalism of the figures, and the remarkable technique of oil painting which they invented, and which was universally adopted in modern art. (See EYCK.) Among the followers of Jan van Eyck in the school of Bruges, which he founded, was Petrus Cristus, while at Ghent flourished Hugo van der Goes and Justus van Ghent. The chief follower or rival of Jan van Eyck was Rogier van der Weyden

who established the school of Brabant, at Brussels, and added dramatic power and vehemence of expression.

Of the work of the early Dutch school few pictures survive. Haarlem was its centre, and Aelbert van Ouwater, celebrated for his landscape backgrounds, was the reputed founder. The work of his pupil, Gerrit van Haarlem, resembles contemporary Flemish painting, as does also the later work of Dierik Bouts (d. 1475), of Haarlem, founder of a school at Louvain. He excelled in luminous treatment and improved the landscape, contributing depth and variety of character to the school. The greatest master of the next generation is Hans Memling (d. 1495), who surpassed other Flemish masters in delicate brushwork and refined sentiment. Among his followers was Gheeradt David (d. 1523), who introduced breadth of treatment, especially in landscapes, though real freedom of style only came with the influence of Italy.

During the fifteenth century a Renaissance had also begun in *Germany*, differing from the Flemish in that, although showing a strong impulse toward realism, it retained the gold backgrounds, with an innocent fervor and a graceful sentimentalism derived from the Gothic. The chief seat of this art was Cologne, and its principal master was Stephan Lochener (d. 1451). About 1450 the Flemish influence made itself felt in Germany, and during the same period important local schools flourished in Southern Germany, commonly grouped together under the name of the Swabian school. At Kolmar the chief master was Martin Schongauer (d. 1488). The chief seat of the school of Franconia is Nuremberg, and its principal master is Michael Wolgemut (1434-1519). Nuremberg also dominated the art of Bohemia, Silesia, and Poland (Cracow). On the whole, German art in the fifteenth century was unprogressive in character, and not until the sixteenth century, under Italian influence, did it pass this primitive stage.

In *France*, *Spain*, and *Portugal* the Flemish influence predominated for the most part during the fifteenth century, though finally yielding to the Italian. In France pictorial art found more expression in miniatures (see MANUSCRIPTS, ILLUMINATION OF) than in panel painting. The art resembled the Flemish, except that the advance to realism was slower and less marked. The chief master was Jean Fouquet of Tours, a portrait painter and illuminator, who practiced a detailed and exact art, like the Flemish, but with softer color, individual French characteristics, and some Italian influence.

In Spain paintings were imported during the fourteenth century from the Netherlands and from Italy. Jan van Eyck himself visited Spain, and some of the best works of Petrus Cristus and Roger van der Weyden went there. In Aragon Florentine influence was predominant, but in Castile, where artistic production was greater, there was more Flemish, while Seville shows an amalgamation of both. The most famous artist of the fifteenth century was Antonio del Rincon (1446-1500), Court painter to Ferdinand and Isabella, who is said to have abandoned Flemish art for Florentine, as did also Alejo Fernandez at Seville. Another important name is Juan de Borgoña (1495-1533), who labored chiefly at Avila and Toledo. Notwithstanding foreign influence, the Spanish painters of the early Renaissance display a distinct national tendency, chiefly evident in a general brownish tone and in the landscapes. In Portugal Flemish influence prevailed until late in the sixteenth century, when it was replaced by the Italian.

EARLY RENAISSANCE—ITALY. Italian painting had the great advantage of flourishing contemporaneously with a very high intellectual and a general artistic development. What the Northerner knew but imperfectly, as a result of his own observation, the Italian based on scientific knowledge of natural laws. The laws of linear perspective (q.v.) were discovered and applied by Brunelleschi and Alberti; anatomy was scientifically studied, even the skeleton being drawn before the flesh and the draperies. Renaissance architecture afforded large wall spaces for decoration and the resulting frescoes gave a monumental character to painting. The study of the antique tended to idealize art and afforded decorative motives; but the Italians only saw in it a means of approaching nature. Finally, a natural tact prompted them to subordinate detail, while not neglecting it, to higher poetic truth, thus giving their art the charming naturalism which is its chief characteristic during the fifteenth century.

During the fifteenth century *Florence* retained its primacy of Italy, both as to the number of artists and the character of work produced. Florentine work was especially good in intellectual qualities, excelling in all respects except in color. (See FLORENTINE SCHOOL OF PAINTING.) The first painter who can be distinctly classed as belonging to the Renaissance is Masolino (1383-1447), whose works show advance in perspective, composition, and anatomy. All of these qualities were achieved to a greater extent by Masaccio (1401-28), the most prominent figure in Italian painting between Giotto and High Renaissance. His figures are powerful and dramatic, and show complete mastery of perspective. Every detail has its purpose, and in his composition every figure is a necessity. His frescoes in the Brancacci Chapel were the models of the century, and their influence may even be seen in the works of Michelangelo and Raphael.

None of Masaccio's followers or contemporaries equaled him. A group of Naturalists, the head of which was Paolo Uccello (1397-1475), made valuable experiments in perspective and were good in drawing, but lacked composition and pictorial feeling. Other members of this school were Andrea del Castagno, Domenico Veneziano, and Alesso Baldovinetti. Masaccio's real successor was Filippo Lippi (1406-69), a painter of great imagination and charm, who excelled in the essentially pictorial qualities of color, light, and shade, and was the first to portray individual faces in the sacred pictures. (See MADONNA.) The school of Filippo Lippi contains important names. Sandro Botticelli's (c.1447-c.1510) paintings are full of poetic sentiment and deep spirituality. His art is the most subtle of the century, though highly individualized, both in his dreamy Madonnas and in his large mythological pictures. Filippino Lippi's (1457-1504) painting, modeled upon that of his father and Masaccio and influenced by Botticelli, is also full of grace and sentiment.

Among other Florentine painters of the period were Benozzo Gozzoli, a pupil of Fra Angelico, who painted attractive frescoes with portrait heads, and Piero di Cosimo, known by his mythological pictures on a small scale. Another distinct group was composed of painters who were at the same time goldsmiths. Their habit of metal work is seen in the treatment of flesh, which is bronze-like in color, in the rigid draperies, and the high relief in which the figures are modeled. Chief among this group are the Pollaiuolo brothers, who flourished in the latter half of the century, and especially Andrea Verrocchio (1435-88). Among Verrocchio's pupils were Leonardo da Vinci (see below) and Lorenzo di Credi, whose work is less strong than graceful. Finally, Domenico Ghirlandajo (1449-94) combined in his art the various tendencies of the century, being an able technician in most respects, and a pleasing artist, but one who lacked the genius to produce a new style.

During the fifteenth century the Sienese school lagged behind the Florentine, the true heir of its sentiment and color being the *Umbrian school* (q.v.), which developed an ecstatic and sentimental type, although throughout its life the school was influenced by the Florentine. The first painter in whom we find this distinctly Umbrian sentiment is Niccolo da Foligno (d. 1502), a pupil of Benozzo Gozzoli. At Perugia some progress was made by Benedetto di Buonfiglio (d. c.1496), although he never mastered drawing, and by Fiorenzo di Lorenzo (d. 1521). The first to accept the Florentine Renaissance was Piero degli Franceschi (d. 1492), a learned painter who wrote a treatise on perspective. His pupil, Melozzo da Forli (1438-94), achieved admirable results in foreshortening, but the pupil of Franceschi and Da Forli, Giovanni Santi (d. 1494), the father of Raphael, was an artist of little originality. The most distinguished pupil of Piero degli Franceschi was Luca Signorelli (1441?-1523), who was rather Florentine than Umbrian in spirit. A master of anatomy, he relied only upon the human figure to express emotion, foreshadowing in this regard and in his exaggerated action the genius of Michelangelo. More distinctly Umbrian was Pietro Perugino (1446-1523), the master of Raphael, who clothed Umbrian sentiment in a Florentine garb. His strong points were grace in composition and a richness of color, due to his successful use of oil painting. The art of Pinturicchio (1454-1513) resembled that of Perugino in type and sentiment, save that it was decorative in character. At Rome the popes were munificent patrons, but there was no native school, the talent being imported from other parts of Italy. Nor was there a noteworthy native school in Naples or in Sicily, where the taste rather inclined to the art of the Netherlands.

There is no connection between *Paduan* painting of the fourteenth century and the school established by Francesco Squarcione (1394-1474) in the latter half of the fifteenth. Its chief characteristics were the statuesque character of the figures, which are usually coarse and heavy, and the wealth of classic ornamentation employed. (See SQUARCIONE.) Andrea Mantegna (1431-1506), the chief master of the school, understood the antique more thoroughly than any other painter of the Early Renaissance, combining with this knowledge a trenchant realism, and achieved the greatest results of the century in foreshortening. The influence of the school of Padua extended throughout Northern Italy, where it occupied a position analogous to that of the Florentine in Middle Italy.

At *Venice* Byzantine art dominated longer than anywhere else in Europe, and even in the early fifteenth century the painters were craftsmen rather than artists. A great influence, however, was exercised by Gentile da Fabriano, especially upon the school of the outlying island Murano, the chief representatives of which belonged to the Vivarini family, whose work also shows Paduan influence. Carlo Crivelli (d. 1493?) in his repulsive figures and decorative motifs was essentially Paduan, only revealing his Venetian origin in a superior color. The eldest member of the Bellini family, Jacopo (d. 1470), followed Gentile da Fabriano to Florence, but also worked in Padua, where Mantegna became his son-in-law. His son, Gentile (d. 1507), treated Venetian subjects with open-air effects and knowledge of light and atmosphere. A second son, Giovanni (d. 1516), was the true founder of those qualities of color which distinguished the Venetian school. At first under Paduan influence, he adopted the oil technique recently introduced into Venice, securing transparent and harmonious effects. Of the pupils of the Bellini, Vittore Carpaccio (d. c.1522) developed legendary subjects, while Cima da Conegliano (d. after 1508) excelled in modeling and in light and shade. Marco Basaiti (d. 1521), although he brought oil technique to high perfection, possessed little originality, as is also true of Vincenzo Catena (d. 1531), the portraitist. Of very great importance for Venetian and Italian art was the Sicilian portrait painter Antonello da Messina (d. 1493), by whom oil painting was introduced from Flanders into Italy.

At *Ferrara* a school arose, chiefly under Paduan influence, but more charming in color. (See FERRARESE SCHOOL OF PAINTING.) The founder was Cosimo Tura (d. 1498?), and its chief artists were his followers, Francesco Cossa and Lorenzo Costa (1460-1535). They afterwards removed to Bologna, where Costa's rugged and manly style was softened by Umbrian sentiment. He was probably the master of the Bolognese Francia (1450-1518), in whom Umbrian sentiment preponderated, and who was in later life somewhat influenced by Raphael. The work of Francia's pupil Timoteo Viti (1469-1523) is pervaded by delightful sentiment and a deep poetic feeling, which he probably imparted to Raphael.

In the cities of *Lombardy* were schools of some importance, though none of them, during the fourteenth century, achieved the eminence of the Paduan or Venetian schools. The school of Verona, founded by Vittore Pisano (d. 1456), was influenced by Padua as regards the modeling of the figure, but was independent in its color scheme, which, notwithstanding the use of several bright tints, tended to be gray or brown. The founder of the early Milanese school was Vincenzo Foppa (d. 1492), and its greatest representatives were Borgognone (d. 1523) and Bartolommeo Suardi (d. 1529-36), called Bramantino.

HIGH RENAISSANCE (1500-50)—ITALY. The highest development of Italian painting falls,

roughly speaking, in the first half of the sixteenth century, though works belonging properly to the High Renaissance were produced in the last decade of the fifteenth, and the Venetian school maintained its excellence almost to the end of the century. A deeper study of the antique, though not to the neglect of nature, brought artists nearer the ideal type. Certain mighty geniuses arose, uniting in themselves, each in a different fashion, the best elements in the rich art of the fifteenth century, and produced the highest development of figure painting the world has ever seen.

Most of the leaders of the movement were either born or trained at *Florence*. Leonardo da Vinci (1452-1519) was the pioneer. The greatest all-round scientist of the day, besides being a musician and a sculptor, he was also the greatest theorist on art, which especially qualified him for teaching. He achieved the greatest mastery hitherto attained over atmosphere, light, and modeling. Nevertheless, his paintings charm more by the sweet and majestic presence of his figures, and by mysterious sentiment, which pervades them, than by their technical qualities. Though Michelangelo Buonarroti (1475-1564) was primarily a sculptor, no artist of the Renaissance had a greater influence upon painting. He made no progress over his contemporaries in the essentially pictorial qualities, but in his great fresco cycle in the Sistine Chapel he obtained the highest possible perfection in drawing of the human figure and in decorative effect. The quality of his purely subjective art which most impressed itself on his contemporaries was his tendency toward the gigantic in form and the violent in action. Directly the opposite was Raphael (1483-1520), the most objective of painters, whose art was a composite of the best elements in Middle Italian art. Himself an Umbrian, he acquired poetic sentiment from Timoteo Viti and tenderness from Perugino; at Florence he learned composition from Fra Bartolommeo, modeling and subtle charm from Leonardo, and from Michelangelo drawing and force. But all these qualities were duly assimilated, and his art was pervaded by an individuality, which especially revealed itself in a wonderful harmony.

Even after this great trinity had left Florence, important artists remained. The works of Fra Bartolommeo (1475-1517), a pupil of Roselli, are pervaded by deep religious feeling, and reveal high technical qualities, especially in color. His co-worker Albertinelli (1474-1515) has an art resembling his, though it is less religious. Of greater importance than either was Andrea del Sarto, the best colorist of the Florentine school, in fresco as in oils. He attained the highest technical qualities that had hitherto been attained in brushwork, warmth of color, and atmospheric effects. His chief pupils were Franciabigio, who excelled in portrait painting, Jacopo Pontormo, and Il Rosso.

At *Milan*, from about 1485 till 1499, Leonardo da Vinci was at the head of the academy founded by Lodovico Sforza, exercising a predominant influence upon painting there. The most important of his pupils and followers were Andrea Solari (born c.1460), who attained many of his master's high qualities; Bernardino Luini (d. 1533?), the most important of the group, in whose art Leonardo's vigor is replaced by graceful, pathetic sweetness; and Gaudenzio Ferrari (d. 1546), who was grander in style and more brilliant in color, though often excessively sentimental. Among the less important though still good painters of the school were Beltraffio (1467-1516), Marco d'Oggiono (d. 1530), and Cesare da Sesto.

Properly speaking, there was no distinctly *Roman* school of painting, the term being applied to the pupils of Michelangelo and Raphael, and the Mannerists who labored there after them. Of Michelangelo's pupils, the principal was Sebastiano del Piombo (d. 1547), a Venetian, who had studied under Bellini and Giorgione, and attempted to unite Venetian color with Michelangelo's line; others were Marcello Venusti (b. 1515) and Daniele da Volterra (1509-66). Of Raphael's pupils, Giulio Pippi (Romano) (1492-1546) was the chief, but even in his work Michelangelo's influence is predominant. Though excellent as a draughtsman, his violent compositions tended toward the Baroque. Others among Raphael's pupils were Francesco Penni (died 1528), Giovanni da Udine, Perino della Vaga (1500-47), and Polidoro da Caravaggio, the last three being mainly decorators. Andrea Sabbatino (died c.1545) transmitted Raphael's art to the south of Italy, where it prevailed for the remainder of the century.

At *Siena*, art, which had lain dormant during the fifteenth century, was resuscitated in the sixteenth by Antonio Bazzi (1477-1549), generally known as Sodoma, a pupil of Leonardo, who treated the human figure with much grace and expression. The most important of his numerous pupils was Baldassare Peruzzi (1481-1536), an architect and a fine decorative painter. Girolamo della Pacchia (born 1477) was rather a rival than a pupil of Sodoma.

The painters of *Ferrara* and *Bologna* are often classed as followers of Raphael, though wrongly so, since they maintained a distinct local character. Their chief characteristics were a cool though pure scheme of color, a less conventional composition than the Romans, and an original use of landscapes as background. The most important representatives were Dosso Dossi (c.1479-1542), a pupil of Costa, who was also influenced by the Venetians; Garofalo (1481-1559), best known from pictures on a small scale from Bible history, who was influenced by Raphael. Other prominent contemporary artists of the school were Mazzolino, Bagnacavallo, and Innocenzo da Imola. The High Renaissance of Northern Italy (outside of Venice) found its greatest master in Correggio (1494-1534). The pupil of various obscure masters, but active chiefly in Parma, he was the principal exponent of the nature worship of the Renaissance—of the material beauty of things, and of poetic sensuality. His technical advances were in the treatment of light and shade, and in perspective.

The *Venetian* school of painting (q.v.) differed from others principally in this respect, that it sought only pictorial effects. Its painters developed color as it had been developed nowhere else in the world, treating light and shade in such a manner as to bring out all local tints, and were the first to practice a broad and facile brushwork. The chief painters of the High Renaissance in Venice were directly or indirectly pupils of Bellini. The pioneer was Giorgione da Castelfranco (c.1478-1511), in whose

hand the new oil medium was used with subtle skill to portray the effects of light and color in landscape, which he created on a new and unprecedented scale, as well as upon the human figure. Palma Vecchio's (d. 1528) color was gaudier than Giorgione's, and he painted everything in a bright golden light. He is chiefly known by female portraits of highly developed charms. Lorenzo Lotto's (d. 1556) art was more subtle, being charming, even coquettish, in style.

As a painter pure and simple, Titian (1477-1576) was the greatest of the Italian school. He was the first to handle a brush with absolute freedom and facility, and in his art the sensual beauty, harmony, repose, and gorgeous glow of color of the Venetian school found its culmination. He has shown us, perhaps, as no other has done, the ideal, free and happy, unfettered by the real. Among the large number of his assistants and pupils was Paris Bordone (1500-71), whose art resembles Titian's, though it is more realistic, and found its best expression in portraits. The works of the three Bonifazi are idyllic in feeling, brilliant, and rich in color. Likewise under Palma's influence stood Rocco Marconi (born c.1505), who learned the elements of his art from Bellini.

The Renaissance lasted longer in Venice than elsewhere, and almost to the end of the century painters of the highest rank appear. Among these, Tintoretto (1518-92) sought to combine with the color of Titian the line of Michelangelo in his violent and impetuous style. Paolo Veronese (1528-88) continued the original tendencies of the Venetian school, both as to color and subject, developing *Existenz-Malerei* (painting expressions of the joy of living) to its highest extent. It was mostly decorative. He was par excellence the great painter of banquet scenes.

The artistic influence of Venice also extended to its subject territories on the mainland. At Udine Pellegrino (d. 1547) and Pordenone (1483-1539), a decorative painter of high dramatic power, were active. Though under Venetian influence, the Brescian school had very distinct characteristics, chief among which was a silvery tone. Its chief master was Moretto (1498-1555), a very individual artist, able in composition, fine in line, and delicate in color. His pupil Moroni (d. 1578) excelled in his portraits, which are essentially modern and realistic in spirit.

High Renaissance—Germany. In the early sixteenth century German painting reached its highest development. Gradually emancipating itself from the detailed execution incidental to its connection with engraving, it paid more regard to the ensemble, and while holding fast to the realism peculiar to German art, it aimed at a loftier and more ideal treatment. Although this change was in part due to Italian influence, German art continued to maintain a distinctly national character.

It was reserved for *Nuremberg* to produce the most original and imaginative German artist of all times. The pupil of Wolgemut, Albrecht Dürer (1471-1528), inherited the angularity of line and detail of the German school. The Italian influence (Barbari and Bellini), to which he was subjected, tended to soften and idealize his art, but without loss of individuality. Perhaps greatest as an engraver, he was, nevertheless, strong and effective as a painter, admirable in line and often excellent in color. His pupils Schautelin and Hans von Kulmbach combined his style, the latter inclining more to Italian methods. Followers of Dürer also were the 'Little Masters,' rather engravers than painters, and so called because of the size of their plates. They included such artists as Georg Penez (d. 1550) and the Beams.

In the sixteenth century the centre of the *Suabian school* shifted to Augsburg, where the Renaissance developed a more self-sufficient composition, better use of color, and more sense of the ensemble than anywhere else in Germany. The founder of the school was Hans Burgkmair (1473-1531), a pupil of Schongauer, and about 1508 Hans Holbein the elder adopted the Renaissance, bequeathing to his son his realistic style and conception. Hans Holbein the younger (1497-1543), the greatest painter Germany ever produced, excelled in all the essentially pictorial qualities, and knew how to combine fine detail with a good ensemble. Although influenced by Mantegna, he was self-sufficient and individual in his forceful realism. The other centres of the Suabian school are less important. The Renaissance came into Ulm through Martin Schaffner (mentioned c.1500-1535), remarkable for his graceful and fine composition; prominent as a portraitist was Bernard Strigel (d. 1528). At Kolmar (Alsace) flourished Matthias Grünewald, the 'Correggio of Germany,' unique among German painters in his attention to color, light, and atmosphere, rather than detail. The chief painter at Strassburg was Hans Baldung Grün (c.1476-1545), whose works show the influence of Schongauer and Dürer. The so-called Saxon school was founded by Lucas Cranach (1472-1553), a Franconian master, whose work, though typical and interesting, is angular and strained, without shadows or aërial perspective.

The Decline. As early as 1530 the decline of the Renaissance in Italy began. In the forms of Raphael and Michelangelo the *Manneristi* (q.v.) executed great crowded compositions, of exaggerated action and striking effects of light and shade, and only in portraiture were they tolerable. At Florence Bronzino (d. 1572) and Vasari (1511-74) were among the chief masters; at Parma Parmegiano (1504-40); at Urbino Barocci (1528-1612), who followed Correggio; at Rome the brothers Zuccari and many lesser masters. The Sienese school alone remained true to nature, as did Luca Cambiaso (1527-85) at Genoa. At Venice the Manneristi came later, and maintained still something of the glory of Venetian color, as is evident in the dashing technique of Palma Giovane (1544-1628) and the fine color of Padovanino (1590-1650).

In the *Netherlands* the influence of Italian art did not at first destroy the native development. The principal Flemish painter of the early sixteenth century, Quentin Massys (d. 1530), introduced genre painting, life size figures and Renaissance background, the last under Italian influence, to which he became subjected late in life. Socalled Lucas van Leyden (1494-1533) the most important painter of the early Dutch school, whose works are original in composition and style, and brilliant in color. Massys founded the school of Antwerp, which henceforth becomes the centre of Flemish painting. Its painters sought to graft Italian art upon the Flemish stock, as did also the less numerous contemporary Dutchmen. Among the principal repre-

tatives are Jan Mabuse (d. 1541), Barend van Orley (d. 1542), Lambert Lombard (1505-66), Frans Floris (d. 1570), and others; the portraitists Jan van Scorel and Antonis Mor; the landscapists Joachim Patinir (d. 1524), Hendrik Bles (Civetta), Paul Bril, and the Breughels.

In *France* during the sixteenth century Flemish art, as well as Italian, found patronage at the Court of Francis I. Jehan Clouet (d. 1541?) and his son François (d. 1572), Court painters to Francis I., were thorough Flemings. But the King's chief importations were Italians, and the extensive decorations of Il Rosso, Primaticcio, and others at Fontainebleau, gave the tone to French art of the century. The principal native artist was Jean Cousin (d. 1589), a man of great talent and versatility, whose surviving works show Italian influence.

In *Spain* the Netherlandish influence disappeared, except in portraiture, both Alonzo Sanchez Coello (died 1590) and his pupil Pantoja de la Cruz (d. 1609) preserving the manner of Antonis Mor. All native originality was engulfed in a mannered Italian style, as exemplified in Berruguete (d. 1561), Becerra (d. 1570), and Morales (d. 1586), of the Castilian school; and in Vergas (d. 1568) and Vicente Joanes (d. 1579), founders respectively of the schools of Andalusia and Valencia. Toward the end of the century the influence of the Venetian colorists, combined with some originality, appears in the works of Navarete (d. 1579), called 'El Mudo,' and of Theotocopuli 'El Greco' (d. 1625), at Toledo, whose chief pupil was Tristan (1586-1640). The same tendency may be seen in the works of Roelas (d. 1625), the chief master of the early Andalusian school, in whose works the national Spanish characteristics first appear. Pacheco (d. 1654), the master of Velazquez, was a mere teacher. At Valencia Francisco de Ribalta (d. 1628) was a pupil of the Carracci, and was influenced by Sebastiano del Piombo. The Valencian school, however, became absorbed in the Andalusian, with a centre at Seville, chiefly under Church patronage, while the chief seat of the Castilian school became Madrid, under Court patronage. The difference between the Spanish schools is rather geographical than artistic.

THE SEVENTEENTH AND EIGHTEENTH CENTURIES.

From a technical standpoint the seventeenth century is the golden age of painting. Technical perfection had been achieved by a few great masters during the Renaissance; but it was not prevalent to the same general extent, and the seventeenth century certainly made advances in the treatment of atmosphere and of light and shade. It saw a broadening of the sphere far beyond the bounds of the old monumental figure painting—an unprecedented development of landscape, genre, and portrait painting. Although it saw the rise of Eclectics as well as Naturalists, it was a realistic rather than an idealistic period. It developed easel painting rather than great decorative pieces. Italy was no longer the seat of the highest artistic development, the sceptre passing to France, and especially to Spain and the Netherlands, where great naturalistic schools developed.

ITALY. Toward the end of the sixteenth century the reaction against Mannerism became manifest in two widely different schools: the Eclectic and the Naturalistic. While not neglecting the study of the antique and of nature, the *Eclectics* sought to combine the excellence of all schools: Michelangelo's line, Titian's color, Correggio's light and shade, Raphael's grace. The pioneers of the movement were the three Carracci brothers, who about 1580 founded the first art academy, in the modern sense, at Bologna. (See BOLOGNESE SCHOOL OF PAINTING: CARRACCI.) They produced an art admirable in technical qualities, but lacking in originality and genius. Of their pupils Domeniehino (1581-1641) was the strongest and most conscientious; Guido Reni (1575-1642) the most gifted, but inclined to sentimentality. There were less important schools at Milan, Cremona, Ferrara, and at Rome, where flourished Carlo Maratti (1625-1713), an inferior kind of Guido Reni. The Florentine school maintained a semi-independent position, deriving inspiration from Andrea del Sarto.

Contemporary with the Eclectics there flourished in Italy the *Naturalists*, who went more directly to nature than they. Their version of nature was an extravagant one, delighting in scenes of passion and bloodshed. Their chief technical characteristics are the use of dark shadow masses, whence the name the 'Darklings' (Tenebrosi), and strong light effects; their line was coarse and strong, and their brushwork harsh. The chief seat of the school was Naples, where it maintained its position as much by the use of poison and the dagger as by artistic production. Caravaggio (1569-1609), the founder of the school, painted figures of the street as saints and angels and genre pictures with much dramatic power. His chief pupil, the Spaniard Ribera (1588-1656), a painter of great strength and fine color instincts, delighted in the gloomy subjects favored by his race. Salvator Rosa (1615-73), likewise of Naples, was a remarkably versatile painter of historical genre and landscape subjects.

FRANCE. Throughout the seventeenth century the Italian influence prevailed in France. The Realists, like the three brothers Le Nain, and Valentin, a follower of Caravaggio, were in the minority. Men like Fréminet (d. 1619) and Vouet (d. 1649) were Mannerists after Italian models. The most important French painter of the century is Nicolas Poussin (1593-1665), the founder of the classic element in French art, whose works represent a purer classical sentiment than Mannerism. He was practically the founder of the so-called heroic landscape (q.v.), which was further developed by Gaspard Poussin (1613-75), and to its highest extent by Claude Lorrain (1600-82). Beautiful and rich in color, and pervaded by a golden or silver haze, his landscapes are full of profound poetic feeling. The establishment of the French Academy at Rome strengthened the connection of French and Italian art. Charles Lebrun (1619-90), who dominated the art of the reign of Louis XIV., painted enormous canvases of classical subjects glorifying the King—works of some decorative merit and original in composition, but poor in other respects. Of about the same merit were the religious paintings of Lesueur (1616-55), an imitator of Raphael. Sébastien Bourbon (1616-71) was more of a colorist, as was also Pierre Mignard (d. 1695), who succeeded Lebrun. The portraitists of the epoch, of whom the chief representative is Philippe de Champagne (1602-74), are far more pleasing.

Spain. The seventeenth century was the golden age of Spanish painting. An art distinctly national in character arose, with a trenchant realism, combined with Catholic devotion, emphasis of light and shade, and a broad execution as its chief characteristics. In the works of Herrera the Elder (1576-1656), at Seville, first appears the striking realism developed so consistently by his pupil Velazquez (1599-1660), who was not only the chief master of the Spanish school, but who, perhaps, achieved the highest technical perfection ever attained. He paints his figures in full atmosphere without artifice in light and shade. They are frankly naturalistic, but individual and characteristic. The color values and the relation of light and shade are perfectly rendered, the brushwork is sure and without effort. His pupils, Mazo (d. 1667), Carreño de Miranda (d. 1685), and others, continned his manner, and the last important painter of the Castilian school was Claudio Coello (d. 1693), whose style was founded upon Titian and Rubens. At Seville Zurbaran (1598-1662), a pupil of Roelas, painted ecstatic religious subjects with Venetian breadth of treatment and heavy shadows, reminiscent of Caravaggio, while Cano's (1601-67) paintings were statuesque in character. The chief master of the Andalusian school was Murillo (1618-82), in whose works the Spanish characteristics, realism and religious ecstasy, are gracefully blended, with charming color effects.

Flanders. Under the leadership of Rubens (1577-1640), the Antwerp school developed an art which, though essentially Flemish as regards its characteristic realism, was much influenced by Italy. His figures lack beauty of face and tenderness of feeling, but they are strong and robust, full of life and spirit. No painter ever produced pictures more brilliant in line and color. His chief pupil was Van Dyck (1599-1641), celebrated for refined aristocratic portraits. Jordaens (1593-1678), coarser and more Flemish than Rubens himself, was rather his follower. Other followers were the portrait painter Cornelius de Vos, and Snyders (d. 1657) and Fyt (d. 1661), painters of game, still life, fruits, and flowers. At the same time there flourished a school of genre painting more distinctly Flemish in character, and resembling the contemporary masters in that line in Holland. The chief representatives are Teniers the Younger (1610-90), who pictured scenes from ordinary life, and Gonzales Coques (1618-84), whose subjects were more refined.

Holland. Dutch painting differed from that of other countries in that it was bourgeois instead of aristocratic. Its prime object was the decoration of the home, and it consequently produced chiefly the small panel pictures. Beginning with portraits, Dutch painting developed in every direction, genre, landscape, cattle, still life, all within a single century—the seventeenth. Among the earliest portraitists were Mierevelt (1567-1641), Ravesteyn (d. 1657), and Keyser (d. 1667), but the chief master of the Haarlem school was Frans Hals (c.1584-1666), one of the greatest portraitists of all times. An astonishing realist of delightful humor, he painted his pictures in full light, and excelled in all pictorial qualities, his strength being only equaled by his facility. The greatest painter in Dutch art was Rembrandt (1606-69), of the Amsterdam school, the master of light and shade. In the emphasis achieved by the use of high lights, in luminosity and transparency of shadows, and in harmony of warm, rich color, he has never been surpassed. A master of realism and characterization in portraiture, he nevertheless grasped universal truths, and in landscape and genre he showed the same breadth of view. His chief pupils were Bol, Flinck, and Eeckhout. Of quite a different character was Van der Helst (d. 1670), whose well modeled heads were more precise and detailed. Among Dutch genre painters, one class devoted itself to peasant scenes, especially in the tavern, coarse in subject, but highly picturesque in character and fine in color; the chief representatives were Adriaen van Ostade, Brouwer, and Jan Steen. Another class, including Gerard Dou, Metsu, Frans van Mieris the elder, Netscher, Jan van der Meer of Delft, and Eglon van der Neer, devoted itself to society of a higher social scale, usually interiors, painted with the greatest detail; the best of this group are the refined Terborg and Pieter de Hooghe.

The Dutch landscape differs from the classic in its realism (see LANDSCAPE), and in the substitution of beauty of tone for that of color, which is subordinated to a prevailing brown scheme. It shows a thorough knowledge of the forms of natural objects and of aërial perspective. Following earlier landscapists like Van Goyen (d. 1656) and Salomon van Ruysdael (d. 1670), the school culminated in Jacob van Ruysdael (c.1625-82) and Hobbema (c.1638-1709). The former's talent was of a gloomy and tragic character; the latter's a sunnier and more friendly. Both confined themselves chiefly to Dutch scenes, while others of the Dutch landscapists made extensive travels. Allart van Everdingen (d. 1675) visited Norway, while Berchem, Dujardin, and Pynacker produced classic Italian pieces. Among cattle painters with whom, however, the landscape is of equal importance, were Paul Potter (1625-54), a harsh realist, Adriaen van de Velde (d. 1672), and Albert Cuyp (1620-91). Of marine painters the most important were Backhuysen (d. 1709), who portrayed the tempest, and Willem van de Velde the younger (d. 1707), who preferred the smooth haven, with ships riding at anchor. The work of the numerous still-life painters is characterized by emphasis of detail. Among these the principal painters of flowers were Jan de Heem, Van Huysum, and Rachel Ruysch; of dead game, Weenix and Van Aelst; of poultry, Hondecoeter; of pots, pans, dishes, and vegetables, Kalf.

Eighteenth Century. The eighteenth century is the transition from the aristocratic art of the seventeenth to the more democratic art of the nineteenth. On the one hand it witnessed, especially in France, an after-development and the decline of the art of the seventeenth; on the other, it saw in England the rise of what may be called an art of the middle classes, which came to prevail universally in the nineteenth century.

With the Regency and the reign of Louis XV., painting in France assumed the frivolous character of the changed Court life, producing admirable decorative pieces for boudoir and hall, charming in color and light in touch. The most important master of the period was Watteau (1684-1721), who depicted delicate and skilful genre pieces of fashionable life. His best pupils

were Lancret and Pater, who continued his style with success, but with Van Loo and Boucher it degenerated into extravagances. Fragonard (1732-1806) was a superior painter, especially in color effects. The principal landscape painter of the day was Joseph Vernet, the chief portraitist Hyacinthe Rigaud. Contemporary with the Court painters were others who painted genre scenes from the life of the middle classes, like Chardin, a good colorist and an able realist, and Greuze, well known through his heads of young girls.

In Italy a style prevailed, originated by Pietro da Cortona (1596-1669), and developed by Luca Giordano (1632-1705), the principal characteristic of which was rapidity of execution. Only in Venice was there real artistic activity. The genre painters Piazetta and Longhi were followed by Tiepolo (1697-1770), the last great Venetian. With an art based upon Veronese, though lighter in color, he painted in a dashing style, but with a strong, picturesque realism. Canaletto and Guardi painted Venetian scenes with fine color effect. In Spain the dearth of talent was broken by Goya (1746-1828), an intense realist of grotesque imagination, who handled his brush with almost the ease of Velazquez, and treated light and shade in a peculiarly individual manner.

England. A prelude to modern painting took place in England during the eighteenth century, which, however important, stands apart from the general development. Up to this time the demand for artists had been supplied by importations, chief among whom were Holbein, Van Dyck, Lely, and Kneller. Consequently there was no tradition to break, and English artists were the first to turn directly to nature. The first native painter of note was William Hogarth (1697-1764), a coarse realist of original technique, who used art as a vehicle for inculcating moral ideas. He was, however, less influential than Sir Joshua Reynolds (1723-92), the founder of the academic element in English painting. His art was eclectic, but his portraits are dignified realistic presentations. Far more original was Gainsborough (1727-88), who went directly to nature for inspiration, and whose highly poetic temperament is as evident in his portraiture as in his landscapes, in which he is an innovator. The art of Romney (1734-1802), another portraitist, was midway between that of Reynolds and Gainsborough. In landscape Richard Wilson (1713-82) continued the classic manner of Claude, while in Morland (1763-1804) England produced a most able painter of genre and animal subjects. At the same time a school of water-colorists, founded by Cozens (1752-99) and Girtin (1775-1802), introduced brightness of tone and *plein air* methods, preparing the way for the modern landscape. This medium, further developed by Thomas Stothard (1755-1834) and Turner, has always been one of the strong points of the English school.

MODERN PAINTING.

France. Owing to the intelligent patronage of the State, as well as to the artistic character of the people, the hegemony in the fine arts in the nineteenth century, especially in painting, belonged to France. Here the epoch making movements in its development have originated, and the chief representatives have appeared.

The first great factor in modern painting was the *classical reaction* upon the Rococo art of the *ancien régime* corresponding with the French Revolution in politics. Neglecting the essentially pictorial attributes, it sought the chief beauty of art in form, as shown in ancient sculpture, and preferred to depict strictly classic subjects. The leader was David (1748-1825), dictator of art under the Republic and the first Empire, where his teachings prevailed for half a century. His dignified and statuesque style was continued by many pupils, among whom were Girodet, Guérin, Regnault, Vincent, Prud'hon (1758-1823), a good colorist, who stood rather apart from the rest, while Gros (1771-1835), in his Napoleonic battle-pieces, led the way toward Romanticism. Ingres (1780-1867) modified Classicism by the study of Raphael and the great Italians, greatly improving its modeling. To his influence the fine draughtsmanship of the modern French school is perhaps chiefly due.

Corresponding with the romantic revolt in literature was one against the prevailing classic traditions in painting, which began about 1830. *Romanticism* saw in the expression of the painter's emotional nature the highest beauty of art. Disregarding classical restraint in line and composition, it placed the chief emphasis upon color and natural truth. Géricault (1791-1824) made the beginning, but upon his early death the leadership passed to Delacroix (1799-1863). In warm prismatic colors and with regard for the general effect only, he depicted tragic subjects in a highly dramatic manner. His disciples include the realist Gigoux, the younger Isabey, and others who painted historical subjects, like Devéria, Cogniet, Roqueplan, Robert Fleury. The Orientalists were Romanticists, who, following Delacroix's example, went to the Orient for subjects. Among the best known are Decamps (1803-60), Marilhat (1811-47), and Fromentin (1820-76). To the same group belong later the painters Théodore Frère and Ziem, the latter famous for Venetian scenes, and Regnault (1843-71), also a fine portraitist.

The *Barbison* painters represented the emotional impulse of Romanticism as applied to landscape. Influenced by the *plein air* work of Constable and Bonington, they went directly to nature, portraying it with fine feeling for light, atmosphere, and color. Their pictures were never photographic, but expressions of poetic moods. Corot (1796-1875) was the lyric talent of the group, the painter of the silvery tones of morning and evening; Rousseau (1812-67), the epic, treating the majestic phases of nature; Jules Dupré, the dramatic; Diaz, the fantastic. To the same group belong Daubigny (1817-78), Chintreuil, and Français, and later painters like Cazin and Harpignies, the latter being rather realistic. The most prominent animal painters were Troyon (1810-65), who renders the character of cattle in truthful fashion; Jaques, the sheep painter, and Van Marcke, pupil of Troyon. More realistic and far less artistic in feeling are the animal painters Auguste and Rosa Bonheur. At Barbison also lived Jean François Millet (1814-75), who has depicted the dignity of life and labor of the French peasant with great force and simplicity and high artistic feeling. Jules Breton (1827—) is more academic and less of a thinker.

Meanwhile painters had begun to unite the excellencies of the contending factions. Under

Louis Philippe, Delaroche (1797-1856), a popular but weak painter of historical scenes, united romantic subjects and color with classic line, as did Horace Vernet, the battle painter, and Ary Scheffer. More classic in character were Flandrin, 'the religious painter of France,' Gleyre, and the Neo-Greeks, like Hamon, Aubert, and Gérôme, in the earlier part of his career. The term Semi-Classicists is applied to a group of painters under the Second Empire, who combine academic training, romantic color, and realistic treatment, like Cabanel, Bouguereau, Gérôme, Lefèbre, and perhaps Henner. Among the chief portrait painters are Bonnat, the realist, and Carolus-Duran, while Laurens (1838—), Benjamin Constant, and Rochegrosse treat historical subjects. Baudry (1828-86), the decorator of the New Opera, is rather a follower of the Italians of the sixteenth century. In a class by himself stands the idealistic Puvis de Chavannes (1824-98), the great French decorative painter, whose art reminds rather of the early Florentines.

The third great factor in French art is *Realism*, as established in the forties by Gustave Courbet (1819-77). He advocated the abolition of academic law and of sentiment, and the portrayal of nature just as it is, and he practiced these theories in his strong materialistic painting. He had no direct pupils, but his influence has permeated French painting. The painters of military subjects and genre show realistic influence, like Meissonier (1815-91), whose art, however, is based upon seventeenth-century Dutch. Among his followers in fashionable genre Vibert is the best known; among the military painters are De Neuville and Detaille. The genre scenes of Ribot and Roybet are of a different kind and more artistic, while among still-life painters Vollon (1833—) has never been surpassed.

The fourth great factor in the art of the present day is so-called *Impressionism*, the advocates of which organized in 1874. Their progress consists in the abolition of the traditions of color and modeling, which the realists retained, and by rendering the impression they attained a better portrayal of life and motion. (See Impressionist School of Painting.) Manet (1833-83) was the founder of the school; the present head is Claude Monet, the painter of pure daylight, and among its chief representatives are Pissaro, the founder of *pointillisme* (dotting with pure tints), and the figure painters Degas and Renoir. Akin to their art is the work of Monticelli (d. 1886). Their doctrine soon spread among other artists, winning such men as Besnard, Carrière, and Raffaelli, who have portrayed the picturesqueness of the lower classes. The art of Bastien-Lepage (d. 1884) is a compromise between realism and the new high light painting, as is that of his many followers, like Renouf, Dagnan-Bouveret, and Fantin-Latour. In late years an imaginative reaction against the materialistic side of impressionism, a new idealism, found expression especially in the Exhibition of 1900, in such men as Henri Martin, Aman-Jean, Fournier. The greatest of this group is Gustave Moreau (1826-98), whose numerous pupils have applied his maxims to every phase of modern life.

Germany. A great influence upon German art was exercised by the writings of the archæologist Winckelmann (d. 1768). Raphael Mengs (1728-79) put his theories into practice, and Carstens (1754-98) followed them to their logical consequence, utterly neglecting color and inaugurating the cartoon style, which so long dominated German art.

The reaction against Classicism took the form of an imitation both in form and religious spirit of Italian masters of the fifteenth century, inaugurated at Rome about 1815 by German painters generally known as the 'Nazarenes' under the leadership of Overbeck (1789-1869). (See Pre-Raphaelites.) Of these painters Cornelius (1783-1867) became head of the Munich school, and, to meet the great demand for mural decoration, he practiced the cartoon style of painting, which was good in drawing and composition, but in which pictorial qualities were neglected. His chief follower was Kaulbach (1805-74), who used cartoon painting to express philosophic ideas. At Düsseldorf, on the other hand, under the teaching of Schadow, a school of painting arose, which paid attention to color, and represented the romantic tendencies of German art. (See Düsseldorf School of Painting.) The greatest German mural painter of the nineteenth century, Alfred Rethel (1816-59), was from the school of Düsseldorf, while the principal romantic painter, Moritz von Schwind (1804-71), came from Munich. Romantic landscape found its highest development in Karl Friedrich Lessing and his pupils, like the brothers Achenbach, while Friedrich Preller and Rottmann, by a revival of the heroic landscape, represented the classical tendencies.

A great change was effected in German painting by the French and Belgian colorists, and to the generation of the fifties Paris was the high school of art. The earliest of these French trained artists was Anselm Feuerbach, who refined the French influence by contact with the Italian. At Munich Piloty (1826-86) engrafted French color on the cartoonist style. Among his numerous pupils were the Austrians Makart (1840-84), who was a still greater colorist, and Gabriel Max. Meanwhile the genre pictures began to bring art back to real life; especially well known in this line are Knaus, Vautier, Ramberg, Defregger, and Grützner.

The greatest change over German art, however, came after 1870, when historical painting definitely gave place to that of life—to realism. Most prominent among German realists is Menzel (1815—) of the Berlin school, likewise a great colorist. Neither he nor Pettenkofen (1822-89), a figure painter on realistic lines at Vienna, had influential following. In Munich there was a period of fruitful study of the old masters, the greatest product of which was the portraitist Lenbach (1836—), a brilliant colorist and delineator of character. Leibl occupied at Munich the same position as Courbet in Paris.

With the Munich exhibition of 1879, French Impressionist painting became known in Germany. The chief representatives of the new art are Liebermann at Berlin, a genre painter; Uhde, who paints Scriptural subjects in contemporary life and costumes; and Max Klinger, the most brilliant of the younger painters. In a class for himself stands the Swiss Arnold Böcklin (d. 1901), brilliant in color, weird in imagination. At Vienna Klint, leader of the Secessionists, represents Impressionist views. Munkácsy (d.

1900), the best known Hungarian painter, was rather Parisian in technique.

GREAT BRITAIN. Until late years English art was little affected by that of the Continent. Among portrait painters were the dignified and impressive Scotchman Raeburn (d. 1823), the vivacious and clever Laurence (d. 1830). The tendency was toward the historical picture of an academic order, in which two Americans, Copley (d. 1815) and Benjamin West (d. 1820), had high repute, as had Etty (d. 1849), Haydon (d. 1846), and Eastlake (d. 1865)—all mediocre as painters. The greatest of all, though without color sense or technical training, was the imaginative genius William Blake (1757-1827). England is the home of genre painting executed with high detail, like that of the Scotchman Wilkie (d. 1841), Mulready, Collins, Newton, and Frith. In landscape the English have been peculiarly original. Turner (1775-1851) is the great representative of the heroic landscape, which he developed with modern methods and dazzling color effects. Here also the *paysage intime* (see LANDSCAPE) originated, chiefly through John Constable (1776-1837), who was the first to eliminate the brown tone in favor of nature's blues and greens. Cox was his chief pupil, and Bonington the intermediary between his art and French.

The reaction against English academic tendencies came in 1848 through the Pre-Raphaelites (q.v.), among whom Rossetti was the best colorist, Holman Hunt the most detailed and laborious, Burne-Jones (d. 1898) the most decorative. Millais (d. 1896) soon became more of a realist, but Madox-Brown, Walter Crane, and Watts lean toward the Pre-Raphaelites in sentiment. Leighton (d. 1896) is more classical and academic. Among the best known contemporary painters are Holl, Herkomer, and Shannon; among landscapists Cecil Lawson, Stanhope Forbes, Alfred Parsons, Luke Fildes, and Henry Moore for marines. At Glasgow is a school which has more affinity with Paris than with England, and which has been influenced by Whistler.

OTHER EUROPEAN COUNTRIES. Spanish painting after Goya followed the French, though adding some national touches. The greatest influence of the century was wielded by Fortuny (1839-74), a sparkling genre painter—a follower of Meissonier. Other important names are Madrazo, a facile portraitist, Zamacois, Zuloaga, a high light painter, and Rico, a painter of Venetian scenes. Italy has fluctuated between German and French influence, of late years the latter. The chief painter of the century is Segantini (d. 1903), the Italian Millet, whose grand Alpine peasant scenes are of a strikingly original style. Genre painting, in imitation of Fortuny, is much practiced by such well-known artists as Michetti, De Nittis, Boldini, and others, the last named being a portraitist Parisian in technique.

In Scandinavian countries the influence was at first German, but in late years, under Parisian teaching, important schools of high-light painters have arisen. The Danish (Johansen) is homelike and quiet in color, the Swedish more cosmopolitan and Parisian (Zorn), the Norwegian primitive (Thanlow). In Russia the early influences were Byzantine; but of late years a modern school has arisen, chiefly under French influence, but with some strong national traits. Among the best known are Vereshtchagin (d. 1904), the military painter, Repin, for historical, and Maliavine for figure subjects. In Poland there is a school extremely national in subjects, though not especially in technique, the chief representatives of which are Matejko and Siemiradzki. For the Belgian and Dutch schools, see NETHERLANDS SCHOOLS OF PAINTING.

UNITED STATES. In the Colonial period British portraitists were active in America, but none of these possessed essentially American qualities. The Americans Copley, West, Lesley, and Newton were British painters, who passed most of their lives in England. Even after the Revolution American painting remained under British influence, although there was an inclination to follow the Italians in larger subjects. The principal historical painter of this early period was Trumbull (1756-1843), who depicted Revolutionary subjects. Gilbert Stuart (1755-1828), famous for his portraits of Washington, was the chief portraitist, and for the period an excellent colorist. Among other portraitists were Vanderlyn, Allston, the two Peales, Jarvis, and Sully—none of them, except Sully, ever rising above mediocrity.

About 1825 an indigenous art began to appear. It manifested itself principally in the landscape painters of the Hudson River school (q.v.), founded by Thomas Cole. The earliest painters of this school were self-taught, but its work improved with men like Durand, Kensett, and F. E. Church. Connected with this school, at least in sentiment, was the work of Hubbard, Bierstadt, Moran, and others, who painted extensive panoramas of the Rocky Mountains and similar grand scenery, and the work of Sanford, McEntee, Whittredge, Bradford, and Richards, who painted smaller but much better canvases. The portrait painters of the period were Harding, Elliott, Inman, Huntington, and Healey.

Meanwhile the influence of foreign schools, which was to some extent evident in the work of these men, began to make itself felt with greater force. That of the Düsseldorf school was represented by Lentze (1816-68), the painter of Revolutionary subjects. More important was the French influence, introduced by Hicks (1823-90), a pupil of Couture, and especially by W. M. Hunt (1824-79), who was a disciple of the Barbison school, the methods of which he introduced into this country. Important contemporary figure painters were George Fuller, Eastman Johnson, and Vedder, and especially John La Farge and Winslow Homer, both men of high technical accomplishments and great originality. In landscape there were Wyant, Inness (d. 1897), the most original and able American landscape painter, and Homer Martin (d. 1897).

The latest development may be said to have begun with the Centennial Exhibition of 1876, which revealed to American artists the achievements of foreign schools. Since that time it has been the general custom to study abroad, to some extent at Munich, but principally at Paris. Indeed, French methods have become quite generally adopted, although American art has remained national in its choice of subjects and in its conceptions. The principal centre of art is New York, and the new development is especially represented by the Society of American Artists (q.v.), founded in 1878, in opposition to the more

conservative National Academy (q.v.). Among the more important contemporary artists residing in America are W. M. Chase, an excellent technician in all respects, and in all subjects, Blum, Dewing, Thayer, and Kenyon Cox. Figure and genre painting are further represented by men like Simmons, Hassam, Wiles, Blashfield, and Turner; portraiture by Lockwood, Tarbell, and Vinton; landscape by Weir, Twachtman, Theodore Robinson (d. 1896), Horatio Walker and Maynard.

There is nothing essentially national about the American painters who practice abroad. Probably the most important artist of American birth was Whistler (1834-1903), the essence of whose work is refinement, both in conception and color. The work of the other Americans residing at Paris and elsewhere, like Alexander Harrison, Melchers, and Walter Gay, is rather French than anything else. Among the Americans at London E. A. Abbey (1852—) is a good colorist, and Sargent (1856—) is in many respects the greatest portrait painter of the present day.

BIBLIOGRAPHY. The most scholarly history of painting is by Woltmann and Woermann (Leipzig, 1878-88; Eng. trans., New York, 1901). Kugler's *Handbuch der Geschichte der Malerei* (Berlin, 1867) is best known in the English translations, *Italian Schools of Painting*, edited by Layard (London, 1891); and *German, Flemish, and Dutch Schools of Painting*, edited *by Crowe* (ib., 1898). Van Dyke's *History of Painting* (New York, 1901) is a good brief text-book, especially strong in the technical characterization of the artists. An admirable brief German history is that of Muther, *Geschichte der Malerei* (Leipzig, 1899-1900). The standard French works are by Blanc (Paris, 1876) and Viardot (London, 1877). Ruskin's *Modern Painters* (London, 1843-60) is a suggestive and stimulating work.

The best account of Greek painters is still that in Brunn's *Geschichte der griechischen Künstler*, vol. ii. (Stuttgart, 1859; 2d unaltered ed. 1889). Consult also Girard, *La peinture antique* (Paris, 1892). An excellent series of biographies is that edited by Dohme, *Kunst und Künstler des Mittelalters und der Neuzeit* (Leipzig, 1877-86). The best general histories of modern painting are those of Rosenberg (Leipzig, 1894) and Muther (Eng. trans., London, 1895-96). Consult also the *Dictionary of Painters*, by Bryan (new ed. by Williamson, New York, 1903 et seq.). For authorities upon the special schools, consult the articles on the FLORENTINE, NETHERLANDS, and other schools, and upon the special artists.

PAINTS. A paint is composed of a pigment, which is a solid substance ground to a fine powder, mixed with a liquid of such a nature that when spread in a thin film and exposed to the air it will turn into an adhesive and more or less tough solid substance, thus cementing the particles of pigment to each other and to the coated surface. The pigments used in paint-making are of various origins and compositions, but all are of such a nature as to have little or no chemical action on the liquid component. This liquid may be watery, like the solution of glue used in kalsomine, or an oil, like linseed oil; or it may be any kind of varnish. In all cases this liquid part of the paint is, while liquid, called the *vehicle*, and when dry the *binder*. To the mixture of pigment and vehicle there is usually added a *drier* and a *solvent* or *thinner*. Special paints, like 'fire proof' paints and ships' bottom paints, are considered separately in succeeding sections.

PIGMENTS. The only *white pigments* are white lead and white zinc, the former being a mixture of carbonate and hydrate of lead, and the latter an oxide of zinc. The *black pigments* are lampblack, boneblack, and graphite. Lampblack is mainly carbon, and results from the imperfect combustion of oil or gas, the latter being also known as gas black and carbon black. Lampblack is the finest in texture of all pigments, but different lots differ greatly in this respect. The finer grades are the more valuable. It contains some peculiar oily matter, and retards the drying of oil more than any other pigment, but it is, on the other hand, the most durable. The black pigment most commonly used (except in the special class of anticorrosive paints) is boneblack, known also as drop black, and in the finer grades as ivory black. This contains about 10 or 12 per cent. of true carbon, to which it owes its color, the remainder being the mineral matter of the bone, 3 or 4 per cent. of carbonate, and most of the rest phosphate of lime. Graphite, or mineral crystallized carbon, is extensively used in anti-rust paints; it is flaky in structure and brownish-black in color; like all carbon pigments, it is extremely opaque; it is difficult to grind it to a fine powder. The most brilliant *red pigments* are vermilion and carmine. True vermilion, or English vermilion, is a sulphide of mercury. It is a pigment of great opacity and beautiful color, and tolerably permanent in ordinary use. Carmine is the most brilliant red known, and is an organic compound of alumina, such as is technically called a lake. It is rather transparent and is used as a finishing color. Some of the coal-tar dyes also make red lakes of great permanence and beauty. These reds are the only pigments of importance derived from coal-tar colors. Various iron oxides form the ordinary *brownish red and brown pigments*; some of these are of a purple shade; all are deep in color and have great opacity. The hydrated oxides are brighter in color than the anhydrous. Many of these oxide pigments are made from ores containing clays, which make them brown, or, in the case of ochres, yellow. Sienna, which, when roasted, is exactly the color of old mahogany, and is used to stain light woods, is one of these earthy oxides. The most common *yellow pigment* is chromate of lead, which is an orange-yellow substance; the paler shades are made by the addition of sulphate of lead at the time of making the chromate. The pure orange chromate of lead is made by the addition of a solution of bichromate of soda to a solution of nitrate or acetate of lead; by adding sulphate of soda to the bichromate solution, and then mixing this with the lead solution, a mixed precipitate of chromate and sulphate of lead is produced; the sulphate is, therefore, a proper ingredient in medium and light chrome yellows. By precipitating Prussian blue in a similar manner with chromate of lead, chrome greens are made. Cadmium yellow is a brilliant and valuable pigment, a sulphide of cadmium; the chromate of strontium is known as perfect yellow. Oxide of zinc makes a dull and impure kind of yellow. (To

green is the principal green; it fades badly. Paris green is an arsenical compound of copper, very brilliant, but not a very opaque pigment. Chrome oxide makes an olive green of a subdued but handsome color. It is probably the only permanent green. *Prussian blue* is a ferrocyanide of iron, dark blue, somewhat resembling indigo; but the most common blue is ultramarine, an artificial substance whose somewhat variable composition is known accurately only to its makers. It is only moderately permanent. The high price of cobalt blue prevents its extensive use; it is more permanent than other blues. The foregoing are the principal opaque body colors. Besides these there is a large class known as *lakes*, which are made by precipitating the color ingredients of various dyestuffs with suitable chemicals, usually compounds of alumina, barium, or lead. These lakes are commonly used to impart a desired tone to the more opaque pigments. Madder lakes are prepared from madder, and may vary in shade from pink through red and yellow to purple and brown. See MADDER.

VEHICLES. The principal oil used as a vehicle is linseed. This is made by expression from flaxseed; the crude oil is purified by settling, letting it stand two or three months in tanks at a temperature not lower than 70° F.; it is finally filtered. Linseed oil when spread in a thin film absorbs and combines with oxygen from the air, and is converted into a somewhat elastic leathery substance, commonly known as linoxyn. A few other oils have this power in a less degree, but only one equals linseed oil; this is known as tong oil or Chinese wood oil, and appears to exceed linseed oil in this respect. It is, however, higher in price than linseed, and darker in color, so that it is not likely to be used.

DRIERS. Driers act by taking up oxygen from the air and giving it up to the oil. These driers are compounds of lead and manganese, in solution in the oil; these metals have the power of forming two sets of oxygenated compounds, the peroxidized ones having twice as much oxygen as the others. When in linseed oil they give up half their oxygen to the oil, then, being exposed to the air, they absorb a fresh equivalent of oxygen, which again the oil takes from them; in this way they act as carriers of oxygen from the air to the oil, acting, of course, only when the oil is spread out in a film and exposed to the air. Since the oil is thus converted into a solid dry substance, these agents are called driers.

SOLVENTS. Most oil paints contain some turpentine or other volatile solvent. It is generally agreed that turpentine is the best of these; it is slow to evaporate, and any residue which does not evaporate readily oxidizes into a durable resinous substance, highly elastic, while benzine, which is often used as a substitute, is more rapidly volatile. The turpentine mixture retains its complete fluidity some little time after brushing out into a film, and so the brush-marks flow out and disappear, and the whole surface becomes smooth and uniform; but benzine evaporates immediately, and the paint becomes comparatively stiff and shows brush-marks and all imperfections of surface. This is, of course, more marked still in varnishes. Benzine has also a tendency, in some cases, to cause a separation. Kerosene is also used as a substitute for turpentine, but no good paint can be made with kerosene as an ingredient. Artificial turpentines are usually made of high boiling-point benzine or low boiling-point kerosene, scented with eucalyptus and other essential oils. They are not to be used.

FIRE-PROOF PAINTS. The best fire-proof paints are made by grinding into each gallon of paint about a pound of boric acid. Some manufacturers use instead a very soft and easily fusible glass which is powdered and used in the same way. The idea is that when exposed to heat the boric acid or the glass will melt and form an air-proof glaze over the wood; the boric acid also, being slowly volatile, penetrates the surface with a gas which neither burns nor supports combustion. None of these paints are at all fire-proof when fresh, as the oil is so combustible as to overcome the restraining influence of the flux; but when the oil has become oxidized, it no longer burns readily, and, of course, the pigment is in almost all cases incombustible, and the protective action of such paint is then very considerable. The fire-proofing quality of such a paint diminishes with age and exposure, as the boric acid dissolves out and is washed away by the rain.

SHIPS' BOTTOM PAINTS. In general, the subject of painting the bottoms of iron ships may be divided into the preservation of the metal from corrosion and the prevention of fouling. The former is secured by applying any good anti-corrosive paint, and the problem, so far, is like the preservation of metallic structures in general. Some of the paint manufacturers attempt to do this by a special paint; others aim to make their anti-fouling compounds keep the water from the metal plates and serve both uses. The anti-fouling paints work by poisoning the organisms which attach themselves to the ship, and are chiefly of three kinds. One of these has for its active agent the oxides of copper; these were, in the first instance, ground and mixed with Stockholm tar. The copper was supposed to dissolve slowly and to kill the adhering organisms. Its use was suggested by the successful use of copper sheathing on wooden ships, but the generally accepted theory of the action of copper sheathing is that it acts, not by poisoning, but by a process of exfoliation or scaling off; that animals attach themselves to it, but that an outer layer of the copper peels off and leaves a fresh surface. (See SHEATHING.) Another sort of copper paint is a copper soap, made by precipitating a solution of common soap with a solution of some salt of copper, thus making an oleate or some similar salt of copper. This is a soapy or greasy substance, insoluble in water, and is applied hot, making a thick coating. This is not a good foundation for animals or plants to attach themselves to, and it is continually wearing away. The third, and at present the most numerous class of paints, are the varnish paints, already partly described, made from a spirit varnish. The pigment in these may be almost anything; commonly it is oxide of iron, sometimes with some white lead or white zinc; sometimes the coloring matter is Paris green, or some green pigment suggesting copper. The poisonous matter may be some arsenical compound, but in some of the most successful ones it is a mercury compound. The arsenical compounds are very cheap and are undoubtedly poisonous, but the mercury compounds are more

intensely poisonous; that is, they poison with a less amount, but they are very expensive, costing for the most part about a dollar per pound of contained mercury. It may be doubted whether there is much choice among the mercury compounds, as the sea water will convert any of them into corrosive sublimate. The essential thing seems to be to get a varnish which will last as long as possible, regard being had to the absolute necessity of having one which will dry almost immediately, then to put in enough mercury or other poison to last as long as the varnish does, in quantity sufficient to kill everything with which it comes in contact.

MANUFACTURE. Paint being a composite substance consisting of a pigment, a vehicle, a drier, and often a solvent, it is evident that paint manufacture includes first the manufacture of the separate constituents, and second the mingling of these constituents. In large paint works all the ingredients as well as the mixed paint are made in one plant, but in many paint works one or more of the ingredients are purchased, the mixing only being done at the works. Generally described, the process of paint manufacture is to grind the pigment, vehicle, and drier together in special grinding mills, the liquid coming from the mill being the finished paint, which has then only to be sealed in cans or kegs to be ready for sale. The method of manufacturing the various pigments defined in the preceding paragraph differs in each case. Different vehicles, driers, and thinners are also made in different ways.

BIBLIOGRAPHY. Consult: Church, *Chemistry of Paints and Painting* (London, 1892); Terry, *Pigments, Paint, and Painting* (ib., 1893); Hurst, *Painters' Colours, Oils, and Varnishes: A Practical Manual* (ib., 1896); Standage, *The Artist's Manual of Pigments* (ib., 1898).

See MINERAL COLORS; OILS; TURPENTINE.

PAIRING. In parliamentary practice, an arrangement by which two members of a legislature who intend to cast opposite votes on a question agree that both will absent themselves for a limited time, thus leaving the relative strength of their parties unchanged. It has long been a recognized custom in the House of Commons. The first known instance in the United States Congress occurred in 1840. It was severely rebuked by John Quincy Adams, who prepared a resolution declaring that it involved the violation of the Constitution, of an express rule of the House, and of the duties of both parties. The resolution was never voted upon, and the practice, recommended by its obvious convenience, has since become common.

PAISIELLO, pā'sē-zyĕl'lō, or **PÆSIELLO,** GIOVANNI (1741-1816). An Italian musician, son of a veterinary surgeon at Taranto. He received his musical education in the conservatory of Saint Onofrio at Naples. Of his earlier operas produced at Naples the most celebrated was *Dal finto al vero*, composed in 1777. Some of his best works, particularly *Il barbiere di Seviglia*, were written during an eight years' residence at Saint Petersburg. At Vienna he composed twelve symphonies for large orchestra, and the opera buffa *Il re Teodoro*. Between 1785 and 1799 he produced a number of operas for the Neapolitan Theatre, and was appointed by Ferdinand IV. his *maestro di capella*. In consequence of having accepted under the Revolutionary Government the office of national director of music, he was suspended from his functions for two years after the restoration of royalty, but was eventually restored to them. In 1802 he went to Paris to direct the music of the consular chapel; but the indifferent reception shortly after given to his opera *Proserpine* led him to return to Naples, where he died. His compositions are characterized by sweetness and gracefulness of melody, and a simplicity of structure remarkable for the period and conditions in which he lived. Besides no fewer than ninety operas, Paisiello composed masses, requiems, cantatas, an oratorio, instrumental quartets, harpsichord sonatas, and concertos.

PAISLEY, pāz'lĭ. A manufacturing town, municipal and Parliamentary burgh of Renfrewshire, Scotland, on the White Cart, three miles above its junction with the Clyde, and seven miles west-southwest of Glasgow (Map: Scotland, D 4). The town comprises the old portion on the west bank of the river, with long regular streets of warehouses and factories, and the new portion to the east built on level ground. It has fine municipal and ecclesiastical buildings, and the restored remains of the abbey founded in 1164 are the best specimens of their kind in Scotland. The town has several parks and recreation grounds, including Dunn Square, the Fountain Gardens, the Brodie Park, and Saint James Park, with a race course on which since 1608 horse-races, originated by act of the burgh bailies, have been held annually on Saint James's day. The town owns much real estate, and gas, water, and electric lighting works, controls the charities, manages the hospitals, and maintains public libraries and museums, baths, slaughter houses, cemetery, and artisans' dwellings. Paisley may be considered the seat of the thread manufacture for the home and American markets. Tartan cloths, handkerchiefs, carpets, etc., soap, starch, and corn flour are largely manufactured; and dyeing establishments on an extensive scale, power-loom factories, print works, machine shops, bleach-fields, shipbuilding yards, etc., are in operation in the town and vicinity. The manufacture, now almost extinct, of the famous shawls originated at the beginning of the nineteenth century. Commonly recognized as the Roman Vandmara, the town is mentioned in 1157 as Passeleth, a possession of Walter Fitzalan, who six years later founded the priory. Population, in 1891, 66,400; in 1901, 79,350. Consult: Lees, *Abbey of Paisley* (Paisley, 1878); Brown, *History of Paisley* (2 vols., Paisley, 1886).

PAIXHANS, pāk-sēns', HENRI JOSEPH (1783-1854). A French artillery officer, author, and inventor. He was born in France, graduated from the Ecole Polytechnique, and was assigned to the artillery, in which service he became a general officer. The gun called by his name was adopted in France about 1824, and shortly afterwards in England. Paixhans was also distinguished for his other improvements in heavy ordnance, gun carriages, projectiles, and methods of working guns. He strongly recommended the use of cylindro-conical projectiles as going more directly and striking more powerfully than round balls, and as being less exposed to air resistance. He

original Paixhans gun was 9 feet 4 inches long, with a bore of $8\frac{2}{3}$ inches, and a weight of about 7400 pounds; the charge consisted of between $10\frac{1}{2}$ and 18 pounds of powder. It would bear hollow shot of 60 pounds, or solid shot of 86 to 88 pounds. He was the author of several works on naval gunnery. See articles GUNS, NAVAL; ORDNANCE.

PAJARITO. A fish. See HALFBEAK.

PAJOU, pä'zhōō', AUGUSTIN (1730-1809). A French sculptor. He was born in Paris, was a pupil of Lemoine, and obtained the Prix de Rome for sculpture in 1748. On his return after twelve years of study at Rome, he was elected a member of the Academy on the merit of his work, "Pluto Holding Cerberus in Chains" (Louvre), and in 1767 he became professor. Louis XVI. employed him to adorn with sculptures the façade of the Palais Royal, and to execute statues of Pascal, Turenne, Bossuet, Buffon, and Descartes. He executed also the sculptures of the Salle de l'Opéra at Versailles, the ornaments of the Palais Bourbon, and of the Cathedral of Orleans. The Louvre contains a number of his works, among which are the aristocratic bust of Madame de Pompadour, and the charming ideal statue of "Psyche." His art is characterized by exquisite grace, and resembles that of his contemporary, the painter Boucher. He received a handsome fortune from his works, but lost it by the Revolution. Consult his biography by Lebreton (Paris, 1810).

PAK'ENHAM, Sir EDWARD MICHAEL (1778-1815). An English soldier. He was born in County Westmeath, Ireland; entered the army at an early age, and by rapid promotion came to be major-general in 1812. He served under Wellington in the Peninsula, particularly distinguishing himself at Salamanca, where he commanded the division which broke the enemy's centre and brought success to Wellington. In 1814 he was selected to direct the expedition against New Orleans, and was killed in the unsuccessful attack of January 8, 1815. See NEW ORLEANS, BATTLE OF.

PAKHOI, päk-hoi'. A treaty port of Southern China, in the Province of Kwang-tung, situated on the Gulf of Tongking, 280 miles southwest of Canton (Map: China, C 7). The Chinese town is built at the foot of a bluff on the top of which lies the European section. The city serves as the port of Lien-chow. In 1901 its volume of trade amounted to $2,875,000, the chief exports being hides, anise-oil, indigo, and fish, and the imports cotton and woolen goods, petroleum, and opium. Population, about 20,000. Pakhoi was opened to foreign trade in 1876.

PAK-KWA, pä'kwä' (Chin., eight diagrams). Eight figures or symbols said to have been elaborated by the mythical Chinese Emperor Fuh-hi (q.v.). Each consists of a group of three parallel horizontal lines, some of them whole, and some broken in two, the broken lines symbolizing the *yin*, female or negative principle in the cosmogonic theory held by the Chinese, and the unbroken lines the *yang*, male or positive principle. By doubling these groups and ringing the changes on the different possible combinations, a new series of 64 hexagrams was produced, and these form the basis of the oldest of the Chinese classics, the *Yi-King* or "Book of Changes."

PAKS, pōksh. A market-town of Hungary, in the County of Tolna, situated in a marshy region on the Danube, 60 miles south by west of Budapest (Map: Hungary, F 3). The town has a trade in wine and poultry. Population, in 1890, 11,800; in 1900, 12,034, mostly Magyars.

PALACE. Originally a building for the residence of the sovereign, the term being derived from the buildings on the Palatine Hill at Rome, where the successive emperors built their residences and halls of state. In English, the word has strictly no other sense than this; but there are many recent adaptations from foreign languages which are in use among travelers, students of art, and the like. Thus, the Italian *palazzo*, which means a stately private dwelling; and, in some cities, one having a carriage driveway (porte-cochère) admitting to a court, is translated carelessly by 'palace.' Also as 'palazzo' is extended to cover municipal buildings, such as those at Siena, Perugia, Gubbio, and the like, some writers translate Palazzo Communale, Palazzo Municipale, Palazzo Vecchio, by a compound term, of which 'palace' forms a part. More rarely, the French word *Palais*, as in Palais de Justice, Palais de Commerce, is rendered into English as 'palace.' The use of the word for a very costly dwelling-house is a mere exaggerated expression not received into the language, as having a separate signification.

PALACIO VALDÉS, pä-lä'thē-ō väl-dās', ARMANDO (1853—). A Spanish novelist, born at Entrealgo, in Asturias. He passed much of his youth at Avilés, on the coast. After a preliminary training at Oviedo, he went to Madrid to devote himself to the study of jurisprudence and political economy. He became a prominent member of the Ateneo, and was made editor of the periodical *La Revista Europea* when but twenty-two years old. After directing it for three years, he withdrew to give himself up to the composition of novels. The first of them, *El señorito Octavio* (1881), illustrates his fondness for simplicity of plot, and marks him from the start as one who excels in the psychological analysis of the inner man as in the description of the aspects of outer nature. His second novel, *Marta y María* (1883), is by many deemed to be his masterpiece. It deals with the contrast between a life of active, human love and one of virginal and mystic contemplation. In his later novels Valdés inclines toward naturalism. The more recent works—all of great interest and most of them, like the *Marta y María*, now translated into English—are: *El idilio de un enfermo; José*, a charming seaside idyll; *Aguas fuertes*, a collection of tales; *Riverita*, and its sequel, *Maximina*, the latter containing many autobiographical elements; *El cuarto poder; La hermana San Sulpicio; La espuma; La fe; El maestrante; El origen del pensamiento; Los majos de Cádiz; La alegría del capitán Ribot*. The author's ideas with regard to the art of fiction are expressed in essays prefixed to the editions of the *Hermana San Sulpicio* and the *Majos de Cádiz*. Other works of a critical nature are: *Los oradores del Ateneo; Los novelistas españoles; Nuevo viaje al Parnaso;* and, produced in collaboration with Alas, *La literatura en 1881*. Consult: Blanco-García, *La literatura española en el siglo XIX.*, second

part (Madrid, 1891); Howells, in *Harper's Magazine* (New York, April, 1886, and November, 1886); Baxter, "A Great Modern Spaniard," in *The Atlantic Monthly* (Boston, April, 1900); Davidson, in the introduction to his edition of the *José* (Boston, 1900).

PALACKY, pä-läts'kē, Frantisek (1798–1876). A Bohemian historian and political leader. He was born at Hodoslavitz in Moravia, and studied at Pressburg and Vienna. He became archivist at Prague in 1823, and national historiographer in 1839. In 1848 he was a prominent member of the Slavic Congress at Prague, and shortly after acted as representative in the Austrian Diet at Kremsier. A leader of the Czech national party in the provincial Diet of Bohemia, he became a prominent figure in the political life of the Empire, allying himself (although a Protestant) with the Ultramontanes in his opposition to the *Ausgleich* with Hungary. He took part in the Panslavic Congress at Moscow in 1867. Palacky's reputation as historian rests on his *Geschichte von Böhmen* (1836-67), begun in German and continued in Czech, a work based on vast original research into original sources. Other writings are: *Die ältesten Denkmäler der böhmischen Sprache* (1840); *Geschichte des Hussitentums* (1868); *Geschichte des Hussitenkriegs* (1872-74).

PALADILHE, pä'lä'dēl', Emile (1844—). A French composer, born near Montpellier. He studied at the Paris Conservatory under Benoist, Marmontel, and Halévy, and in 1860 won the Grand Prix de Rome with the cantata *Le czar Ivan IV.* During his stay in Rome he wrote an opera buffa and considerable instrumental music, but upon his return to Paris he became more widely known for his songs, which include: "Mandolinata," "Premières peuïnes," and Mélodies écossaises." His first opera, *Le passant*, was produced in 1872, and was followed by *L'amour africain* (1875); *Suzanne* (1878); *Diana* (1885); and *Les Saintes Maries de la mer*, a lyric drama (1892). His most successful opera, *Patrie*, produced in 1886, has been given in Germany and Italy. His compositions also include considerable sacred music.

PALADIN (OF. *paladin*, from It. *paladino*, from ML. *palatinus*, warrior, one connected with the palace, from Lat. *palatium*, palace). A term originally derived from the Counts Palatine, or of the palace (see Palatine), who were the highest dignitaries in the Byzantine Court, and hence used generally for a lord or chieftain, and by the Italian romantic poets for a knight-errant.

PALÆARCTIC REGION. See Palearctic Region.

PALÆASTER (Neo-Lat., from Gk. παλαιός, *palaios*, ancient + ἀστήρ, *astēr*, star, starfish). An extinct genus of starfishes, found in rocks of Ordovician to Carboniferous age in North America and Europe. See Starfish.

PALÆMON, Quintus Remmius. A Roman grammarian of the first century. He was born at Vicentia, the son of a female slave. Unlike the earlier scholars, who had made the older literature the centre of their linguistic studies, Palæmon devoted himself chiefly to Vergil, and is to be remembered for having first introduced the latter's works as a text-book into the Roman schools. His grammar, *Ars*, is said to have been much consulted by later grammarians, but is now lost. The grammar that bears his name is wrongly ascribed to him. He is mentioned by Suetonius (*De Illustribus Grammaticis*, 23), and by Juvenal (vi., 451; vii., 215-219), who says that Palæmon was the master of Quintilian. Consult: Nettleship, in the *English Journal of Philology* (xv., 192); and Marschall, *De Remmii Palæmonis Libris Grammaticis* (Leipzig, 1887).

PALÆOBOTANY, etc. See Paleobotany, etc.

PALÆOCREU'SIA (Neo-Lat. nom. pl., from Gk. παλαιός, *palaios*, ancient, + Neo-Lat. *Creusia*, from Gk. Κρέουσα, *Kreousa*, a character of Greek mythology). A Lower Devonian barnacle that lived as a commensal in cavities of the coral Favosites. See Barnacle.

PALÆOHATTE'RIA (Neo-Lat. nom. pl., from Gk. παλαιός, *palaios*, ancient + Neo-Lat. *Hatteria*, of uncertain origin). A fossil lizard-like reptile of the order Rhynchocephalia, found in the Permian formations of Europe. See Rhynchocephalia.

PALÆOL'OGUS (Lat., from Gk. Παλαιόλογος, *Palaiologos*). The name of an illustrious Byzantine family, which first appears in history in the eleventh century, and attained the Imperial dignity in the person of Michael VIII. (q.v.), who became Emperor of Nicæa in 1259, and mounted the throne of Constantinople in 1261. His successor on the throne was his son Andronicus II., in whose reign, which extended from 1282 to 1328, the Turks commenced a series of assaults on the Byzantine dominions. He associated his son, Michael IX., with himself, but was dethroned by his grandson, Andronicus III., who reigned from 1328 to 1341. The latter was an able warrior and ruler, who repeatedly defeated the Bulgarians, the Tatars of the Golden Horde, and the Servians, but was unsuccessful against the Catalans in Greece, while the Turks during his reign ravaged the coasts of Thrace as far as the Balkans. He was greatly esteemed by his subjects, and well merited the title of 'father of his country.' Andronicus III. was succeeded by his son, John V., who ruled, with some interruptions, from 1341 to 1391. During his minority his mother, Anna, and John Cantacuzenus were regents. The latter in self-protection had himself proclaimed co-Emperor as John VI. in 1341. (See Cantacuzenus.) During John V.'s reign the Turks made great progress, and the Emperor was compelled in 1370 to agree to pay them an annual tribute. In 1376 John was overthrown by his son, Andronicus IV., but regained the crown in 1379. In 1390 the son of Andronicus IV., John VII., dethroned him and ruled for a few months, but John V. ultimately regained the crown, and retained it until his death, February 16, 1391. John VII. sought Turkish aid, and compelled the son and successor of John V., Manuel II. (q.v.), to make him co-Emperor in 1398, but in 1402 he was sent to the Island of Lemnos, and in 1407 some land was given to him in Thessaly and Macedonia which the Turks soon conquered. He died about 1408. The successor of Manuel II. was his son, John VIII., who ruled from 1425 to 1448. On being pressed by the Turks he held out to the Popes the old bait of the union of the Greek and Western churches under his sway, and even presented himself at the Council of Florence, where, in July, 1439, the union of the churches was brought about.

But on his return to Constantinople the opposition of the Greek ecclesiastics to the union, supported by the people, rendered the agreement of Florence a dead letter. The Pope, however, stirred up Ladislas of Hungary and Poland to attack the Turks, but they could not be driven back. John was succeeded by his brother Constantine XI., who ruled from 1448 to 1453, and with him the Byzantine Empire ended. (See CONSTANTINE XI.) A branch of the Palæologi ruled Montferrat, in Italy, from 1306, but became extinct in the sixteenth century. The Palæologi were connected by marriage with the ruling families of Hungary and Servia, and the niece of the last Byzantine Emperor married Ivan III., Czar of Russia—a fact which the Czars of Russia were wont to bring forward as an argument in favor of their claims to European Turkey.

PA'LÆONIS'CUS (Neo-Lat., from Gk. *παλαιός*, *palaios*, ancient + *ὄνισκος*, *oniskos*, fish of the cod kind, diminutive of *ὄνος*, *onos*, ass). A genus of fossil actinopterygian fishes found in the Permian rocks of Europe. The body was long and slender, covered with regular ganoid scales, and was provided with small triangular dorsal, pectoral, pelvic, and anal fins. It is especially common in the shales of England and in the copper-bearing shales of Thuringia, in Germany.

PA'LÆOSPON'DYLUS (Neo-Lat., from Gk. *παλαιός*, *palaios*, ancient + *σπόνδυλος*, *spondylos*, *σφόνδυλος*, *sphondylos*, vertebra). A very interesting fish-like fossil found in the flagstones of the Old Red Sandstone at Achanarras, near Thurso, Scotland. The entire fossil is scarcely two inches long, and it consists of an anterior broader cephalic portion and a long posterior slender vertebral column, terminated by a delicate feather-like fin. The structure of the head resembles that of the recent lamprey, and on this account Palæospondylus is supposed to be an ancestral lamprey, in which all the cartilages were calcified. Consult: Dean, "The Devonian Lamprey, Palæospondylus gunni Traquir, with Notes on the Systematic Arrangement of the Fish-like Vertebrata," in *New York Academy of Sciences, Memoirs*, vol. ii., part i. (New York, 1899). See CYCLOSTOMI.

PA'LÆOTHE'RIUM (Neo-Lat., from Gk. *παλαιός*, *palaios*, ancient + *θηρίον*, *thērion*, diminutive of *θήρ*, *thēr*, wild beast). An extinct perissodactylate hoofed mammal of the size of a rhinoceros found in abundance in some Eocene deposits of Europe. It was described and named by Cuvier in 1804 from specimens exhumed at the gypsum quarries at Montmartre, near Paris. By some authors it has been looked upon as a three-toed ancestor of the horse, but it is more properly considered to represent a lateral offshoot from the main line of evolution of the horse. See HORSE, FOSSIL.

PALÆ'PHATUS (Lat., from Gk. *Παλαίφατος*, *Palaiphatos*). A Greek mythographer, of an uncertain period, who is said to have written in several books an historical and allegorical explanation of Greek myths. Of this work there is extant only a short abstract, *On Incredible Tales* (*Περὶ ἀπίστων*), which was formerly a favorite school book. In it Palæphatus gives a brief account of about fifty of the most celebrated Greek legends, and explains them according to the method of Euhemerus. The treatise has been edited by Westermann, in his *Μυθογράφοι* (Brunswick, 1843). Consult Wipprecht, *Questiones Palæphateæ* (1892).

PALAFOX Y MELZI, pä'lä-fōks' ē mâl'thē, JOSÉ DE, Duke of Saragossa (1780-1847). A Spanish patriot and soldier. He entered the army in 1792, and was lieutenant in 1808. Upon the invasion of the French he carried on a fierce guerrilla warfare against them; was made Captain-General of Aragon; unsuccessfully attempted to hold the line of the Ebro, and distinguished himself by his heroic defense of Saragossa, July 27-August 14, 1808, and December 20, 1808-February 21, 1809. He was taken a prisoner to France and kept at Vincennes until the restoration of Ferdinand VII. in 1814, when he was made Captain-General of Aragon. He commanded the National Guard from 1820 to 1823, and afterwards lived in disgrace till 1836, when he became Duke of Saragossa and grandee of the first class.

PALAIHNIHAN, pä-lī'nē-ăn (Klamath *p'laikni*, mountaineers). A small linguistic family of North American Indians, living in northeastern California, in the basin of the Pit River, whence they are called also Pit River Indians. Seven tribal divisions have been recognized among them. In their social life and morals, no less than in their vigor, the Palaihnihan tribes are among the lowest aboriginal peoples.

PALAIS BOURBON, pä'lä' bōōr'bōN'. See CHAMBRE DES DÉPUTÉS.

PALAIS DE JUSTICE, pä'lä' de zhụs'tēs'. A group of buildings on the Ile de la Cité in Paris, occupying the site of the old royal palace, and devoted to the law courts. Of the ancient palace, which was presented to the Parlement by Charles VII. in 1431, the only portions spared by the fires of 1618 and 1776 are the Tour de l'Horloge, containing the oldest public clock in France, dating from 1370, the famous Sainte-Chapelle (q.v.), the Conciergerie (q.v.), the so-called Kitchens of Saint Louis, and three towers. During the war of the Commune in 1871 a large part of the structure was destroyed, but has been restored. A number of the courts open into the Salle des Pas-Perdus, one of the largest halls in existence, 240 feet long, 90 feet wide, and 33 feet high. The hall was formerly the great hall of the royal palace, and consists of two galleries separated by arcades. It contains several monuments and statues. The chief entrance of the Palais de Justice is formed by the handsome Court of Honor, adorned with allegorical statues.

PALAIS ROYAL, pä'lä' rwä'yäl' (Fr., royal palace). The name now borne by a heterogeneous mass of buildings on the eastern side of the Rue Richelieu in Paris, composed of a palace, theatres, public gardens, bazaars, shops, cafés, and restaurants. The old palace was built between 1619 and 1636 on the site of the Hôtel Rambouillet by Cardinal Richelieu, who at his death bequeathed it to Louis XIII. It subsequently became the residence of the Orleans branch of the Bourbons, and during the minority of Louis XV. acquired a scandalous notoriety as the scene of the wild orgies in which the Regent, Orleans, and his dissolute companions were wont to indulge. In the time of his great-grandson, Philippe Egalité, it became the focus of revolutionary intrigue. This prince, partly to repair

his impoverished fortune and partly to prove the sincerity of his professed sympathy with the people of Paris, converted part of the gardens of the Palais Royal into a place of public resort, and the pavilions of the great court into bazaars, which were divided into shops and stalls. On the downfall of Egalité the building was taken possession of by the Republican Government. On the restoration of the Bourbons it was occupied by Louis Philippe till his elevation to the throne of France in 1830, when it was incorporated in the general domains of the State. The palace was sacked by the mob during the Revolution of 1848, when many of its works of art were destroyed. It was thoroughly repaired and magnificently furnished in 1855, and given by Napoleon III. to his uncle, Jerome Bonaparte, whose son, Prince Napoleon, resided there until 1871. The Communists set fire to the palace in 1871, and all the apartments occupied by the Prince were destroyed, but the flames were checked before they spread to the galleries and shops, and the injured portions were restored in the autumn of 1873. The garden, with its avenues and parterres, fountains, and grass plots, still constitutes one of the liveliest and most frequented spots in the whole city; and its cafés still maintain, in great measure, their former reputation. The north side of the grand court is occupied by the Théâtre du Palais Royal, devoted to high comedy and farce.

PALAME'DES (Lat., from Gk. Παλαμήδης). In Greek mythology, a hero, son of Nauplius and Clymene. In Homer he is not mentioned, but in the later literature on the Trojan War he plays a prominent part, being especially noted for his quick understanding and resource. His wit detected the simulated madness of Odysseus, by placing the infant Telemachus in front of his father's plow. To him also was ascribed the invention of letters, numbers, weights and measures, money, dice, and draughts. This last, we are told, was to divert the army in a time of scarcity. His death was attributed to the jealousy of Odysseus and Diomedes, or the revenge of Odysseus, but the stories as to the plot and its execution varied widely. The name Palamidi, which is now borne by the rocky height above the modern Nauplia, is commonly believed to point to a cult of the hero in the neighborhood. Consult Jahn, *Palamedes* (Hamburg, 1836).

PALAMEDESZ, pä'lä-mä'dĕs, ANTONIS (*c.*1601-73), surnamed STEVAERTS. A Dutch painter, born probably at Delft, or, according to Houbraken, in London, where his father, a gem-setter and painter, was in the service of James I. He entered the guild of Delft in 1621, and was its president in 1673. He painted the figures in Van Delen's architectural pictures, and probably through him met Dirk Hals, whose influence is noticeable in his works. His subjects are portraits or military scenes, treated with vivacity and glowing color. Among his authentic works are: "Portrait of a Young Man," in the Berlin Museum; "Spanish Soldiers and Girls in a Peasant's Cottage" (1632); "A Soldier Bargaining for a Hare;" and a "Soldier Making Love," all in the Museum at Hanover; and a guard-room scene, in the Liechtenstein Gallery in Vienna. With Van Delen, he painted "The Meeting of the States-General" (1651), in The Hague Museum. His brother, PALAMEDES PALAMEDESZ (1607-38), was his pupil, and painted much the same subjects in the same manner, but with less skill. There is a spirited "charge of Cavalry" in the Berlin Museum signed with his name.

PALAMON' AND ARCITE, ăr'sīt. Two Theban princes, imprisoned by Theseus, who both loved Emilia, sister to Hippolyta. Their story is told by Chaucer, in the "Knight's Tale," which was taken from Boccaccio's "Teseide." A French poem, "Palamon and Arcite," by Anne de Graville, appeared in 1487. The same story is used in Fletcher's tragedy *Two Noble Kinsmen*, printed in 1634, but probably written in 1606 and said to have been revised by Shakespeare. The tale is also used in Edwardes's play *Palamon and Arcite*, now lost, produced for Queen Elizabeth, at Oxford, 1566. Another lost play of this title is mentioned in Henslowe's *Diary* as played in 1594. Dryden introduced a version of the story in his "Fables" in 1700.

PALANPUR, or **PAHLANPUR**, pälän-pōōr'. A native State of Gujarat, India, Bombay (Map: India, B 4). Area, 3177 square miles. Population, in 1891, 274,804; in 1901, 222,027, the decrease being due to the effect of the plague and famine of 1899-1900. The capital, Palanpur, is a station of the Rajputana-Malwa line, and had a population of 17,599 in 1901.

PALAPRAT, pä'lä'prä', JEAN, Sieur de Bizet (1650-1721). A French dramatist, born at Toulouse. He became secretary to the Grand Prior of Vendôme (Louis of Cleves). With David Augustin de Brueys he wrote a number of plays once esteemed for their wit. He himself was the sole author of a few, including *Les Quiproquos* and *Hercule et Omphale*. All were collected in five volumes in 1735-55.

PALATE (OF. *palat*, from Lat. *palātum*, *palatus*, palate, roof of the mouth). The palate forms the roof of the mouth, and consists of two portions, the hard palate in front and the soft palate behind. The framework of the *hard palate* is formed by the palatal process of the superior maxillary bone, and by the horizontal process of the palate bone, and is bounded in front and at the sides by the alveolar arches and gums, and posteriorly it is continuous with the soft palate. It is covered by a dense structure formed by the periosteum and mucous membrane of the mouth, which are closely adherent. Along the middle line is a linear ridge or raphe, on either side of which the mucous membrane is thick, pale and corrugated, while behind it is thin, of a darker tint, and smooth. This membrane is covered with scaly epithelium, and is furnished with numerous follicles (the palatal glands). The *soft palate* is a movable fold of mucous membrane inclosing muscular fibres, and suspended from the posterior border of the hard palate so as to form an incomplete septum between the mouth and the pharynx; its sides being blended with the pharynx, while its lower border is free. When occupying its usual position (that is to say, when the muscular fibres contained in it are relaxed), its anterior surface is concave, and when its muscles are called into action, as in swallowing a morsel of food, it is raised and made tense, and the food is thereby prevented from passing into the posterior nares, and is at the same time directed obliquely backward and downward into the pharynx. Hanging from

the middle of the soft palate's lower border is a small conical pendulous process, the *uvula*; and passing outward from the uvula on each side are two curved folds of mucous membrane containing muscular fibres, and called the *arches* or *pillars of the soft palate*. The *anterior pillar* is continued downward to the side of the base of the tongue, and is formed by the projection of the palato-glossus muscle. The *posterior pillar* is larger than the anterior, and runs downward and backward to the side of the pharynx. The anterior and posterior pillars are closely united above, but are separated below by an angular interval, in which the *tonsil* of either side is lodged. The tonsils (*amygdalæ*) are glandular organs of a rounded form, which vary considerably in size in different individuals. They are composed of an assemblage of mucous follicles intermingled with diffuse adenoid tissue and covered by a mucous membrane. The follicles secrete a thick, grayish matter, and open on the surface of the gland by numerous (12 to 15) orifices.

The space left between the arches of the palate on the two sides is called the *isthmus of the fauces*. It is bounded above by the free margin of the palate, below by the tongue, and on each side by the pillars of the soft palate and tonsils.

As the upper lip may be fissured through imperfect development (in which case it presents the condition known as the hare-lip), so also may there be more or less decided fissure of the palate. In the slightest form of this affection the uvula merely is fissured, while in extreme cases the cleft extends through both the soft and hard palate as far forward as the lips, and is then often combined with hare-lip. When the fissure is considerable, it materially interferes with the acts of sucking and swallowing, and the infant runs a great risk of being starved; and if the child grows up, its articulation is painfully indistinct. When the fissure is confined to the soft palate, repeated cauterization of the angle of the fissure has sometimes been found sufficient to effect a cure by means of the contraction that follows each burn. As a general rule, however, the child is allowed to reach the age of five or six years without intervention, when the operation of *staphylorrhaphy* (suture of the soft parts) is performed. If the fissure involves the hard palate as well as the soft palate, that structure is also repaired at the same time, the operation being known as uranoplasty. Acute inflammation of the tonsils is treated of in the article QUINSY.

Chronic enlargement of the tonsils is very frequent in children and the adolescent, and is not infrequently met with in adults. Its usual symptoms in children are muffled speech, obstruction in breathing, and a disposition to acute attacks of tonsillitis. Deafness occasionally is present both in children and adults from pressure of the enlarged tonsils upon the openings of the Eustachian tubes. The condition of chronic tonsillitis is to be met by general measures designed to improve the tone and nutrition of the individual, such as an open-air life and the use of such tonics as iron and cod-liver oil. When the symptoms of enlarged tonsils are especially noticeable and the general health is suffering, the organs should be removed by surgical measures.

The *uvula* is subject to relaxation or elongation. When this occurs the appendage is found to be more or less œdematous and protruding downward toward the larynx, where, by its irritation, it often gives rise to a constant tickling cough. The condition is usually relieved by astringent applications and gargles. Where these fail to relieve the condition, the excess must be cut away by the surgeon.

PALATINATE (F. *palatinat*, from ML. *palatinus*, palatine, from Lat. *palatinus*, relating to a palace, or to the Palatine Hill, from *palatium*, palace, Palatine Hill). A feudal district whose ruler exercised nearly all the prerogatives of sovereignty. Under the Frankish Merovingian kings, a *comes palatinus*, or count of the palace, was a high judicial officer residing at Court. After the time of Charlemagne, the office became localized and territorial, and the *comes palatinus* ruled in almost complete independence over his own district, often near the frontier. As early as the eleventh century the Count Palatine (Pfalzgraf) of the Rhine appears among the hereditary princes of the German Empire. In the thirteenth century the term palatinate or county palatine was introduced into England from the Continent to designate a jurisdiction whose beginnings can in some instances be traced back to Anglo-Saxon times. There were three principal counties palatine in England—Chester, Durham, and Lancaster—whose origin and development were no doubt influenced by their proximity to the frontier. The counts or earls palatine ruled over entire counties, so that all the landowners held feudally of them; they received the whole profits of the courts and exercised all the regalia or royal rights, nominated the sheriffs, held their own councils, and acted as independent princes, except in the owing of homage and fealty to the King. The Duchy of Lancaster was a creation of the year 1351, but has since 1399 been united with the Crown in such manner that the King ruled within its borders not as King, but as Duke Palatine of Lancaster. Its legal jurisdiction has since 1873 been transferred to the High Court of Justice, but its revenues are still independent of Parliamentary control. Chester was united with the Crown in 1301, and has since, together with the Principality of Wales, been vested in the eldest son of the sovereign. Durham ceased to be a separate jurisdiction under the Bishop of Durham in 1836. Other counties palatine were formerly Kent, Shropshire, Pembrokeshire, the Isle of Ely, and Hexamshire, though the varying extent of their immunities makes it difficult in some cases to determine whether they were true palatinates. In very early times there were similar jurisdictions in Scotland, the most important of which was that of Strathearn. The Province of Maryland, in America, was granted to the Baltimores, on the model of the Palatinate of Durham. Consult: Stubbs, *Constitutional History of England*, vol. i. (6th ed., Oxford, 1897); Lapsley, *The County Palatine of Durham* (New York, 1900).

PALATINATE, THE (Ger. *Pfalz*, palace). The name of two little countries in the old German Empire, the Upper Palatinate and the Lower or Rhenish Palatinate, which were politically connected till 1620. The Upper Palatinate is at present included within the Bavarian district of the Upper Palatinate (Oberpfalz) and Regensburg. The capital was Amberg. The Lower Palatinate (Unterpfalz) was composed of an ir-

regular and disjointed territory on both sides of the Rhine, included roughly within the space marked off by the cities of Mainz, Worms, Heilbronn, Landau, and Zweibrücken. It included the Electoral Palatinate (with Heidelberg, and for a time Mannheim, as its capital), the Principality of Simmern, the Duchy of Zweibrücken (Deux Ponts), the principalities of Veldenz and Lautern, etc. Within its borders were embraced also the episcopal sees of Worms and Speyer, the free cities of Worms and Speyer, the county of Leiningen, etc. The Counts Palatine of the Rhine (see PALATINATE), whose original seat was Aix-la-Chapelle, appear in the eleventh century as holding a leading position among the hereditary German princes. In 1214 the Rhenish Palatinate was acquired by the House of Wittelsbach in the person of Louis I., Duke of Bavaria, and thereafter for four hundred years its history is the usual story of partition and reunion, varied with occasional increase of territory through purchase. Early in the fourteenth century a part of Bavaria between the Danube and the Fichtelgebirge was made over by the Emperor Louis the Bavarian to his kinsmen ruling in the Rhenish Palatinate; this was the origin of the Upper Palatinate. In 1356 the Golden Bull of the Emperor Charles IV. designated the Count Palatine of the Rhine as one of the seven Imperial Electors. Rupert I. of the Palatinate founded the University of Heidelberg in 1386. Rupert III. occupied the Imperial throne of Germany from 1400 to 1410. The Reformation made rapid progress in the Palatinate, and, influenced by the teachings of Melanchthon, the Elector Frederick II. (1544-56) embraced the reformed faith. Under Frederick III. (1559-76), who inaugurated the Simmern line in the Electoral Palatinate, Calvinism was made the established religion, and the Heidelberg Catechism was drawn up (1563). Frederick III. also aided the French Huguenots and extended his protection to Protestant refugees from France. Frederick IV. (1583-1610) became head of the Evangelical Union formed in 1608 by the Protestant States for the protection of their interests. His son, Frederick V. (1610-32), the son of James I. of England, was elected King in 1619 by the Bohemian Protestants, whose revolt against the House of Hapsburg had inaugurated the struggle which was to be the Thirty Years' War. Frederick was defeated at the battle of the White Hill in 1620 and was deprived of his lands. The electoral dignity was conferred on Maximilian I., Duke of Bavaria, in 1623, and in 1628 this prince was formally invested with the Upper Palatinate. By the Treaty of Westphalia the son of Frederick V. was restored in the Lower Palatinate, and an eighth seat in the Electoral College was created for him, the Upper Palatinate remaining in the possession of Bavaria. During the wars of Louis XIV. the Palatinate, one of the richest and most fertile lands in Germany, was mercilessly devastated by the French armies in 1674 and in 1689. In 1685 the Simmern line died out and was succeeded by the collateral line of Neuburg, whose members were of the Catholic faith. This led to the emigration, in 1709-10, of a large number of Protestant inhabitants (estimated at 13,000) to England. Thence a large body crossed over to Ireland, while others came to North Carolina, Pennsylvania, and Virginia. In 1710 between 3000 and 4000 'Palatines,' as they were called, settled in Columbia and Ulster counties, N. Y., whence many removed to Montgomery and Herkimer counties and to Pennsylvania. In 1742 the line of Neuburg in the Electoral Palatinate was succeeded by that of Sulzbach. In 1777 Bavaria was united with the Palatinate. By the Treaty of Lunéville (1801), the portion of the Palatinate lying on the left side of the Rhine was ceded to France, while the territories on the right bank were partitioned among Baden, Hesse-Darmstadt, Leiningen, and Nassau. The part beyond the Rhine was given up by France in 1814-15 and was divided among Bavaria, Hesse-Darmstadt, and Prussia. The Rhenish Palatinate (Bavaria) was the scene of a revolutionary uprising in 1849, which was suppressed by Prussian arms. The Bavarian Government districts of the Palatinate (Rhenish Palatinate) and Upper Palatinate (Upper Palatinate and Regensburg) have an area respectively of 2289 and 3729 square miles. The population of the former in 1900 was 831,533 and of the latter 553,857. The surface of the Palatinate (which is bounded on the east by the Rhine) is diversified with smiling plains, swelling hills, and wooded mountains. The western portion is traversed by the low range of the Hardt. The region yields bountiful crops of cereals, potatoes, tobacco, hemp, flax, etc., and is noted for its wine. The capital is Speyer. The Upper Palatinate is traversed by the offshoots of the Fichtelgebirge, the Bohemian Forest, and the Bavarian Forest, and is bordered on the west by the Franconian Jura. The Danube flows along the southern border. The capital is Regensburg. Consult: Häusser, *Geschichte der rheinischen Pfalz* (Heidelberg, 1845); Nebenius, *Geschichte der Pfalz* (Heidelberg, 1874).

PALATINE. A name frequently applied in the later days of the Roman Empire to persons in the imperial service whose duties connected them with the court. Under Constantine the Great the Palatini were the troops stationed at the capital in contradistinction to those charged with the defence of the border. In the Byzantine Empire the term was applied to the officials connected with the administration of the finances and the imperial domains. It was bestowed as an epithet of honor on persons in the entourage of the early German kings, and under the Carolingian rulers the Count Palatine was the highest judicial officer of the realm. Though, in the course of time, a number of counts palatine were created and charged with the execution of the imperial will in various parts of the Empire, the title ultimately became restricted to the ruler of Rhenish Franconia whose territory came to be known specifically as the Palatinate (q.v.). In England, after the Conquest, the see of Durham, the earldom of Chester, and the duchy of Lancaster were ruled by counts palatine who were possessed of regal powers within their jurisdiction. They had courts of their own which were exempt from the authority of the king, exercised the right of coining money, and stood at the head of the feudal system of land tenure in their counties.

PALATINE ANTHOLOGY. A collection of Greek poems made by Constantine Cephalas in the tenth century, lost, and rediscovered in 1606 by Salmasius in the Heidelberg Library. It was not, however, published until 1776, when

it appeared in Brunck's *Analecta*. Consult Thackeray, *Anthologia Graeca* (London, 1877).

PALATINE HILL (Lat. *Mons Palatinus*). The central hill of the famous seven hills of Rome, and the seat of the earliest Roman settlements. In point of historic interest it ranks next to the Capitol and the Forum. Its summit is about 140 feet above the Tiber level. The form of the hill is irregularly quadrangular. Its northwestern slope, toward the Capitoline Hill and the Tiber, was called *Germalus* or *Cermalus*. The origin of the name is uncertain, although several derivations are given connecting it with legendary stories. Romulus is said to have founded the city upon this hill, and on Germalus grew the sacred fig-tree (near the Lupercal) under which he and his brother, Remus, were found sucking the she-wolf. Upon the Palatine were the temple of Jupiter Stator, the temple of Cybele, the sacred square inclosure called *Roma quadrata*, and other sacred places and edifices, and, during the Republic, many of the finest private houses in Rome. Under the Empire it became especially the site of the Imperial residence. Augustus and Tiberius resided here, and at last Nero included it entirely within the precincts of his *aurea domus*, which Vespasian subsequently restricted to the hill. From the time of Alexander Severus it ceased to be the residence of the emperors, except occasionally. Recent excavations have brought to light numerous remains of the structures with which the Palatine Hill was once covered. A considerable portion of the hill remains yet to be excavated.

PALAT'KA. A city and the county-seat of Putnam County, Fla., 60 miles south of Jacksonville; on the Saint John's River, and on the Georgia Southern and Florida, the Jacksonville, Tampa and Key West, the Florida East Coast, and other railroads (Map: Florida, G 2). It enjoys considerable popularity as a winter resort, and is the commercial centre of a productive fruit-growing and market-gardening section, its trade interests being of considerable importance. Population, in 1890, 3039; in 1900, 3301.

PALAUAN, pä-lä'wän, or PALOWAN. A general designation of the Tagbanua tribes from whom the island of Palawan took its name. See PHILIPPINE ISLANDS.

PALAU (pä-lou') **ISLANDS**. A group of islands in the Pacific Ocean. See PELEW ISLANDS.

PALAWAN, pä-lä'wän, or **PARAGUA**, pä-rä'gwä. One of the Philippine Islands, the extreme southwestern of the larger islands of the archipelago (Map: Philippine Islands, C 10). With its numerous dependent islands it forms a continuous chain extending from Mindoro southwestward to the northern extremity of Borneo. The chain runs parallel with the Sulu Archipelago and separates the Sulu Sea on the southeast from the China Sea on the northwest. The island of Palawan itself is of very elongated shape, being 278 miles long from northeast to southwest, with an average width of 20 to 25 miles, narrowed into an isthmus 4½ miles wide a little north of the centre. It ranks sixth in size among the Philippine Islands. Its area is 4368 square miles, with its 98 politically dependent islands 4726, and with the 135 islands forming the group or territorial division 5037 square miles. The island itself is accordingly a little smaller and the group a little larger than the State of Connecticut. The principal dependent islands are the Calamianes (q.v.), lying between Palawan and Mindoro, Dumarán (128 square miles), off the extreme eastern point of Palawan, and Balábac (168 square miles), between Palawan and Borneo. To Balábac belong a number of small outlying islands scattered over the Sulu Sea.

The coasts of Palawan are indented with numerous small bays and sounds, some of which form excellent harbors, especially that of Malampaya (q.v.). The surface consists of an elevated tableland falling rapidly toward the coasts on either side, and the latter are in some places bold and rugged with limestone cliffs. From the plateau an irregular series of summits and ridges, running generally obliquely across the island, rise to an average height of 2500 feet. The highest point is Mount Mantalingajan, in the southern part, with an altitude of 6843 feet. Owing to shape and contour of the island, the streams are all very short. The climate is regulated by the winds to which the island is exposed, the dry northeast trade winds during summer, and the moist southwest monsoons in winter. These moderate the temperature, but malarial fevers are common along the coasts. The flora of the island is rich and varied, with many peculiar species, notably among the pitcher plants, the ferns, and the orchids. The mountains are covered to their summits with immense forests of valuable cabinet, building, and dye woods, including ebony, sandalwood, logwood, and many species unknown to the rest of the archipelago. There are many trees, producing resins, such as dammar, gum mastic, and copal. Among the animals the birds, monkeys, and reptiles are especially abundant, the pythons reaching an enormous size.

Owing to the sparseness of the population, economic activities are in a very primitive state. Agricultural products are raised only for home consumption, and there are no industries beyond the primitive weaving and other manufactures carried on by each family for home use. There are no regular roads, the mountain trails and the rivers being the only means of access to the interior. The island is, however, favorably located for future development, lying along the route from India to China and Manila. Many sailing vessels on that route pass along the eastern coast of the island to avoid the violent monsoons in the China Sea. The inhabitants have never been enumerated, but their number is estimated at 50,000. Aboriginal Negritos inhabit the mountains of the interior; along the coast of the northern half of the island are Malays and mixtures of Malays and Negritos, known as Tagbánuas and Tandulanos. The coasts of the southern half are occupied by Mohammedan Moros. By the Provincial Government Act of June 23, 1902, the northern half of the island, lying north of parallel of latitude 10°, together with the Calamianes and other adjacent islands, was constituted as the Province of Paragua, with the seat of government at Cuyo, on the island of that name in the Sulu Sea. The portion of Palawan lying south of parallel 10°, known as Moro Palawan, was left without civil government, while the island of Balábac, with its dependent islands in the Sulu Sea, forms a distinct political division, the local government of which was es-

tablished by the treaty with the Sultan of Sulu of August 20, 1899. The chief towns of the mainland are Taytay (q.v.), in Paragua Province, and Puerto Princesa (q.v.), in Moro Palawan.

Palawan was a part of the Sultanate of Borneo until the beginning of the eighteenth century, when the Spanish began to found military stations on the island to protect their northern possessions from the Moro pirates. Two attempts by the Spanish authorities to colonize the island, first by importing free immigrants from Luzon, and second by founding convict settlements, were unsuccessful. Palawan was occupied by United States troops during one of the early campaigns in the southern islands. On the establishment of civil government in Paragua there were no military stations in that province. Consult Marche, *Luçon et Paloauan* (Paris, 1887).

PALAZZOLO ACREIDE, pä-lät'sō-lō ä-krā'ē-dā. A town in the Province of Syracuse, Sicily, 22 miles west of Syracuse (Map: Italy, J 10). Near by are the ruins of the ancient Acræ, founded by a colony from Syracuse in B.C. 664. Curious remains are still to be seen, including a small but almost perfect theatre, an aqueduct, a temple, and various tombs and vases. Population (commune), in 1881, 11,154; in 1901, 14,840.

PALAZZO VECCHIO, vĕk'kyō (It., old palace). A commanding structure rising from the Piazza della Signoria in Florence, and dating from 1298. It was originally the seat of the Signoria, the republican Government, and later became the residence of Cosmo I. It now serves as the town hall. The most impressive portion of the building, and one of the most conspicuous objects in Florence, is the massive square tower, rising to a height of 308 feet. The court, dating from 1454, contains the statue of a boy with a fish, which serves as a fountain. It has elaborately decorated columns. The Great Hall was constructed for the Council in 1495. It contains a colossal statue of Savonarola, who in 1498 was burned at the stake at the corner of the palace, on the site now occupied by the great fountain.

PALE. See ENGLISH PALE.

PALE (OF., Fr. *pal*, from Lat. *palus*, stake, pale, from *pangere*, Skt. *paś*, to fix, to fasten). In heraldry (q.v.), one of the figures known as ordinaries.

PALEA (Lat., chaff). A chaff-like bract in certain plants, especially grasses, in which the term is applied to the glume in most intimate relation to the flower. It is also sometimes applied to the 'chaff' which in the heads of many Compositæ subtends the flowers. See GRAMINEÆ.

PALEARCTIC REGION (from Gk. παλαιός, *palaios*, ancient + ἀρκτικός, *arktikos*, northern). A primary division in zoögeography embracing the northern part of the Old World, or Paleogæa. It includes all of Europe, the whole Mediterranean basin, as far south as the Atlas Mountains, lower Egypt, Northern Arabia, Syria, and Asia Minor, the whole of Asia north of the Himalayas, and Japan. It is divisible, according to the scheme of Sclater and Wallace, into four sub-regions, which, however, are not very clearly defined: (1) Europe north of the line of mountains running from the Pyrenees to the Caucasus; (2) the Mediterranean basin, and eastward through Turkey and Persia to the Indies; (3) Northern and Northwestern Asia; (4) Manchuria, Northern China, and Japan. It is contended by many students of the subject that this area is not entitled to rank as a grand 'region' distinct from North America (Nearctic Region, q.v.), but that the two should be joined as one called the Holarctic Region or Arctogæa, and the weight of modern opinion tends toward this view. Some would include Africa in this grand division. Consult maps and authorities cited under DISTRIBUTION OF ANIMALS.

PALEARIO, pä-lā-ä'rē-ō, AONIO, or ANTONIO (c.1500-70). An Italian humanist and reformer, born at Veroli, near Rome. He is also called Della Paglia and Degli Pagliaricci. He was educated in Rome, and remained there until 1529, except for the interval of the siege in 1527. Afterwards he went to Perosa, Siena, where he principally lived, and Padua, where he wrote *De Immortalitate Animorum* (1536), his most important work—a long didactic poem in Latin hexameters. In 1542 he wrote *Della pienezza, sufficienza e satisfazione della passione di Cristo.* The Inquisition pronounced it heretical, but Paleario defended himself against the charge with much eloquence, and successfully. The tract was followed by *Actio in Pontifices Romanos et Eorum Asseclas*, which was not printed until after his death (1606). He was professor at Lucca from 1546 to 1555, and then taught at the University of Milan. The election of Pius V. was the signal for a fresh attack from his enemies. He was formally accused of heresy in 1567, and after a year's imprisonment at Rome, was burned at the stake, in July, 1570. Paleario especially protested against the Roman Catholic doctrine of Purgatory. His other works include three volumes of *Epistolæ*. An edition of his works was published at Amsterdam in 1696, and at Genoa in 1728. The tract *Beneficio di Cristo*, attributed to him, more probably is by Benedetto of Mantua.

PALEMBANG, pä'lĕm-bäng'. A residency of the Dutch East Indies, embracing the region of the Musi River in the southeastern part of the island of Sumatra (Map: East Indies, B 5). It is bordered on the north by the Djambi territory, on the east by the Java Sea, on the south by the Lampongs District, and on the west by the Barisan range. Area, 53,497 square miles. Population, in 1897, 692,317. Palembang is a low and exceedingly fertile region, subject to overflows by the rivers. It has deposits of petroleum. The inhabitants are nearly all Malays and Mohammedans. In the dense forests live the Orang-Kubu, a curious race exhibiting the lowest grade of civilization. Capital, Palembang.

PALEMBANG. The capital of a residency in Sumatra, on the Musi River, about 45 miles from its mouth (Map: East Indies, B 5). It extends four or five miles along the river banks, and lies in a swampy district, which is subject to overflows. The houses are of bamboo, and many stand on rafts in the stream. The town has a fine mosque dating from the middle of the eighteenth century, the palace and tombs of the Sultans, and a fort. There is a considerable commerce, coffee and pepper being the leading shipments. The chief industries are silk weaving, wood and ivory carving, and the manufacture of weapons and gold articles. Population, about 60,000, chiefly Malays and Chinese.

Palembang was conquered by the English in 1812, and by the Dutch in 1821.

PALENCIA, pä-län'thē-ä. The capital of the Province of Palencia in Old Castile, Northern Spain (Map: Spain, C 1). It is situated on the left bank of the Carrión, 24 miles north of Valladolid, and is an old town with narrow streets and few modern improvements. It has a beautiful episcopal palace and a notable Church of San Miguel with a massive square tower. The most prominent building, however, is the Gothic cathedral, which, though it is ill situated and has an uninteresting exterior, is beautifully ornamented within, and contains a rich collection of old Flemish tapestries. The town has a hospital, a bull ring seating 8000 spectators, a provincial institute, a seminary, a normal school, and a municipal academy of arts. The chief manufactures are shawls and blankets, agricultural machinery, fire-works, chocolate, and bricks. Population, in 1887, 15,028; in 1900, 15,610. The ancient *Pallantia* was the capital of the Vaccæi. It was taken by the Romans after an obstinate resistance, and remained an important city through the Middle Ages, being in the twelfth century the seat of the Castilian kings and Cortes.

PALENCIA, Diego Fernandez. See Fernandez de Palencia.

PALENQUE, pä-län'kä. An ancient city of vast extent lying near the village of Santo Domingo del Palenque, in the State of Chiapas, Southern Mexico, and bordering on Guatemala. It is located on the steep slopes of the Tumbala foothills amid the most beautiful tropical surroundings. Almost impenetrable vegetation covers the country, so that up to the present only six existing ancient structures have been described, though it is believed many more exist in the forest. By a series of walled terraces level areas on the slopes have been prepared for the buildings. These were set on steep pyramids, the sides of which were faced with stone or covered with steps. Twelve of these pyramids remain in the Palenque group, the greatest height being about 80 feet. The largest building is called the Palace; the others are named Temple of the Inscriptions, of the Sun, of the Cross, of the Cerro, and of the Bean Relief. The plan of the temple is simple, showing an oblong, rectangular area, divided into two vaulted chambers, the front wall pierced with from one to five door-openings, the middle wall pierced with as many doorways as there are compartments in the back chamber. The two vaulted chambers are the unit of construction, the complicated plan of the palace being made up of a series of such units. The vaults are corbeled and have the form of the so-called Mayan arch, a variety of the triangular. In the rear chamber were set on the back wall finely carved slabs of sacred character, which the building was intended to inclose as a sanctuary. The exteriors of the buildings present several remarkable architectural features; above the vertical walls the roof slopes away at the slant of the arch within, resembling a mansard; the top of the roof slopes gently to the ridge, which is crowned with a high, narrow, perforate comb in the form of an arch, the walls having openings crossed with slabs resembling a grille. The exterior of the buildings was surfaced with plaster and decorated with relief models tinted with color. The mansard slope had complicated relief work in stucco representing masks and figures of gods. The latticework roof comb also bore stucco figures in high relief. The chief feature of the palace is a unique square tower 40 feet high, of which at present four stories and a blind story remain. The builders of Palenque decorated their edifices with sculpture and modeling exclusively in bas-relief, while those of Yucatan sculptured in the round. The most remarkable of the Palenque reliefs are the tablets from the sanctuaries adorned with figures and hieroglyphics. Two of them bear figures in the form of a square cross between standing figures which have attracted world-wide notice. They are in low relief and are worked out with a delicacy of form and refinement of finish superior to that of any other work of stone in this hemisphere. In stucco work also the Palenque artists were the greatest modelers in America. Colors were lavishly used and included black, white, blue, two reds, yellow, and green. While some dressed stone was used, the finish of the walls was almost invariably in plaster. Two important pieces of engineering are found at Palenque, one an arched bridge of masonry 30 feet wide and 40 feet long across the Otolum, and the other a subterranean arched waterway 500 to 600 feet long, 10 feet high, and 7 wide, massively built and inclosing the same stream. New artifacts have come to light at Palenque; some tombs in the pyramids have been excavated and terra-cotta figures showing the characteristic head profile and costume, beads of jadeite, spindle whorls, lance-heads, obsidian knives, etc., have been found. As to the age of the structures it does not seem possible to arrive at any determination. Comparative archæology, however, shows that the builders were of the Mayan stock, which is responsible for the wonderful architectural remains of Chiapas and Yucatan.

Consult: Stephens, *Incidents of Travel in Central America, Chiapas, and Yucatan* (New York, 1848); Bancroft, *The Native Races of the Pacific States* (ib., 1874-76); Bandelier, *Report on an Archæological Tour in Mexico 1881* (Cambridge, 1885); Maudslay, *Biologia Centrali-Americana, Archæology* (London, 1897); Holmes, *Ancient Cities of Mexico* (Chicago, 1895); Charnay, *The Ancient Cities of the New World* (New York, 1887); Peñafiel, *Monumentos del arte mexicano antiguo* (Berlin, 1890); Morgan, *Houses and House Life of the American Aborigines* (Washington, 1881).

PALEOBOTANY. The branch of paleontology which deals with fossil plants. The terms vegetable paleontology, fossil botany, phyto-paleontology, and paleo-phytology are used synonymously, and within the scope of the subject is included the consideration of all dead vegetable matter which is, or which was at any time, buried in the earth; or which has left its traces there in the form of casts or impressions either in solid rock or in incoherent deposits; or which may have become preserved in whole or in part by incrustation, by petrifaction, or by carbonization.

History. Paleobotany, as a science, is practically a product of the nineteenth century, although a number of writers on natural history, Agricola, Albertus Magnus, Matthiolus, Gesner, and others, had long previously described petri-

fied wood in common with other fossils and minerals. Leaf impressions, however, do not appear to have been described previous to the publication of Johann Daniel Magor's *Lithologia Curiosa, sive de Animalibus et Plantis in Lapides Versis*, at Jena, in 1664, and after that not again until Eduard Lhwyd published at London, in 1699, his *Lythophylacii Britannici Iconographia*. Probably the next succeeding work of importance in which fossil plants are mentioned is Johann Jacob Scheuchzer's *Herbarium Diluvianum*, the first edition of which was published at Zurich in 1709. After this, until the end of the eighteenth century, many writers in natural history incidentally described or mentioned fossil plant remains, but generally with exceedingly crude conceptions in regard to their nature, origin, or antiquity.

In 1801 Ernst Friedrich, Baron von Schlotheim, issued his *Abhandlung über die Kräuter-Abdrücke in Schieferthon und Sandstein der Steinkohlen-Formation*, in *Hoffs Magazine*, at Leipzig, and in 1804, at Gotha, his *Beschreibung merkwürdiger Kräuter-Abdrücke und Pflanzen-Versteinerungen, ein Beitrag zur Flora der Vorwelt*. With the advent of this latter work paleobotany, as a science, may be said to have had its birth, and from that time on it has made steady progress. During the years from 1820 to 1838, Kaspar Maria, Count von Sternberg, issued in a series of fascicles at Regensburg, Leipzig, and Prague successively, his *Versuch einer geognostisch-botanischen Darstellung der Flora der Vorwelt*, and in 1828 Adolphe Theodore Brongniart published at Paris, his *Prodrome d'une histoire des végétaux fossiles, etc.* These two works are generally regarded as having placed the science upon a firm foundation, and its subsequent progress was rapid.

During the half century from 1830 to 1880 the science was developed under Goeppert, Unger, Ettingshausen, Saporta, and others, and the fossil floras of the Old World became comparatively well known. J. W. Dawson had been at work on the coal floras of British America as early as 1845; J. S. Newberry about 1850 on those of Ohio; and a few years later Leo Lesquereux began his researches, which ultimately embraced the Carboniferous floras of Pennsylvania, Illinois, Arkansas, and other States, and also the floras of the more recent formations of the Western States and Territories. About the year 1856 paleobotany began to receive a constantly increasing degree of attention as a result of collections of fossil plants made by Government exploring parties and by the Northwestern Boundary Commission. Reports upon these collections were contributed by Newberry, and subsequently both Lesquereux and Newberry undertook the study of the material collected by the United States Geological and Geographical Surveys. The results of their researches appeared from time to time in the reports issued by the surveys and in the transactions of learned societies. With the death of these two pioneers in the subject, in 1889 and 1892, respectively, the historical period of paleobotany in America may properly be said to have terminated. The subsequent labors of Ward, Knowlton, White, Hollick, Penhallow, and others belong to the period of present active work.

GENERAL FACTS AND PRINCIPLES. The extinct flora of the earth, as evidenced by its fossil remains, was gradually evolved from simple forms low in the scale of life into forms successively more and more complex and higher in the scale. Each subkingdom, class, order, or other subdivision of the vegetable kingdom had its own particular time of origin, and all experienced subsequent phases of evolution during which some reached a maximum and then either declined and became extinct or else continued down to the present time, diminished in numbers, and often degenerated in size; while others maintained an upward development which has continued to the present day. It is thus possible to divide geologic time as a whole into a series of plant ages, and to designate each age by the name of the particular subdivision of the vegetable kingdom which was predominant during that age. Such a time division, based upon certain great types of vegetation, would be as follows: (1) Age of Cryptophytes—Eozoic and Paleozoic time. (a) Age of Thallophytes—Archæan, to and including the Upper Silurian period. (b) Age of Pteridophytes—Devonian and Carboniferous periods. (2) Age of Spermatophytes—Mesozoic and Cenozoic time. (a) Age of Gymnosperms—Triassic and Jurassic periods. (b) Age of Angiosperms—Cretaceous, Tertiary, and Modern periods.

Such a presentation of the facts is not, however, entirely satisfactory, for the reason that only the periods of maximum development of each designated type are indicated. A method which presents more accurately the several phases of development of each type and at the same time the development of the vegetable kingdom as a whole is by means of a diagram, in which the successively higher types are represented by a series of successively higher waves, each one having its origin later in geologic time than the preceding one, and subsequently overlapping and rising above it, the crests representing the periods

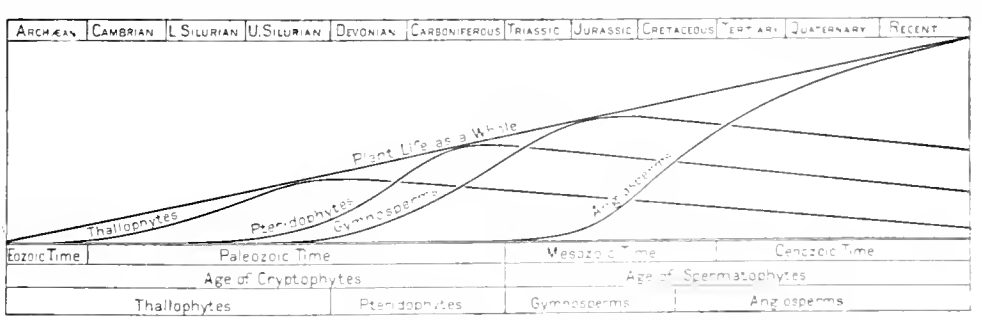


DIAGRAM SHOWING THE DEVELOPMENT OF PLANT LIFE.

of maximum development and a line tangent to the crests the development of plant life as a whole.

The general botanical character, or expression, of any fossil flora is sufficient to determine the era to which it belongs; the identification of a few of its principal genera will determine the period, and the identification of certain typical genera or species may be relied upon for the determination of the exact or approximate age of the particular strata or beds in which they may occur. Recognition of the above facts has led to the acceptance of the broad principle, expressed by Ward, that "Great types of vegetation are characteristic of great epochs in geology, and it is impossible for the types of one epoch to occur in another." This principle is subject to modification, however, when fossil floras of widely separated localities and smaller geological subdivisions are compared. The order of sequence of types has been found to be the same everywhere, but evolution has at times been less rapid in one locality than in others, and hence the same types may occur, in different parts of the world, in strata which are not quite contemporaneous. To this identity of sequence, apart from contemporaneity, the term 'homotaxis' was applied by Huxley.

Relation to Geology. In connection with geology, a knowledge of fossil plants is as essential as a knowledge of fossil animals, whenever paleontological facts are of interest or value. Fossil plants may serve as corroborative evidence in the determination of the geologic age or the stratigraphic relations of strata; in some instances they may present the only available evidence, or, as has frequently happened, they may prove that conclusions deduced from other data are erroneous.

Relation to Botany. The facts relative to the phylogeny, or ancestral development, of the vegetable kingdom supplied by paleobotany have materially aided in placing modern vegetable taxonomy upon a firm and philosophical basis. Many of the now recognized early errors in taxonomy might have been avoided if the path indicated by phylogeny had been followed. Nearly every change which systematic botanists have made in the sequence or grouping of living plants, in their efforts to bring supposed allied forms together, has resulted in producing a taxonomic arrangement more closely approximating the phylogenetic sequence in the evolution of the fossil ancestors. The recognition of the fact that our living flora consists merely of the remnants of that which preceded it enables us to understand the meaning of many otherwise puzzling phenomena, such as that of monotypic genera, like Gingko, Liriodendron, Sassafras, etc., each of which is represented by a single species more or less widely separated biologically from its nearest living allies. Any apparent isolation of this kind in systematic botany was not capable of explanation by means of any known facts in connection with the existing flora.

Paleobotany has been of material assistance in solving many of the problems connected with the geographical distribution of living plants. The genus Sequoia, represented by the redwoods (*Sequoia sempervirens*) and the giant trees (*Sequoia gigantea*) of California, is restricted in its range to a narrow belt on the west coast of the United States, but its fossil remains demonstrate that the genus had in the past a large number of species and a distribution which embraced practically the whole of North America, Europe, and Asia. Geological changes resulted in its extermination throughout the latter region and in all except the one limited area in the former. The genus Nelumbo is represented by two living species, one of which is restricted in distribution to Asia, the other to Eastern North America. When the fossil representatives of the genus were discovered they showed that the genus once extended over the whole of North America and Europe, and it is now recognized that changes in environment almost caused its extinction and left only one representative species in each continent. The problems of abnormal growths or of apparently useless organs in living plants have frequently been explained satisfactorily on the theory of atavism or reversion to ancestral characteristics when their fossil representatives have been examined.

Plants have always been regarded as excellent climatic indices. The fact that certain species or genera or families can exist only within certain extremes of temperature is well known, and hence if a relationship between a fossil flora and living plants of restricted climatic range can be established, it may be accepted as good evidence that the fossil flora was associated with a climate comparable with that of the region in which the similar living flora is now found. Fossil remains of cycads and palms found in the Cretaceous and Tertiary strata in the Arctic zones prove conclusively that tropical or subtropical conditions formerly prevailed there.

Evolution of the Principal Types of Vegetation. Theoretically plant life must have preceded animal life. It is assumed that the primordial vegetation was of an exceedingly low type, biologically, both on theoretical grounds and by reason of its known subsequent development from lower to higher forms. The earth and its waters are supposed to have been for a long period of time in a highly heated condition, and the first vegetation capable of existence under such conditions was probably represented by the lower thallophytes, some of which live in water at a temperature that is fatal to other forms of life. Exactly what the earliest vegetation was like cannot be determined, for the reason that its remains have been either entirely obliterated or else so altered that its original character cannot be recognized. The existence of plant life of some kind at a time when the earliest sediments were laid down is strongly indicated by the presence of carbon in the form of graphite in these rocks.

Thallophytes. By reason of their cellular structure the thallophytes were poor subjects for preservation, while from their microscopic size they would be exceedingly difficult to detect even when preserved. Their comparative rarity as fossils is then to be expected, and such of their traces as are known are for the most part nothing more than casts or markings. The schizophytes, representing the agencies of disintegration and decay, were undoubtedly present at the very dawn of life, but their early existence is predicated upon theoretical grounds.

The fungi are also of comparatively little importance in fossil botany. They are represented by thallus and mycelium fragments, or by the effects produced presumably by these growths in

the tissues of higher plants, notably in those of the Carboniferous period, and there is every reason to believe that they were among the earliest floral elements of the earth. A complete enumeration of all the known fossils which have been classed as fungi has been made by Alloysius Meschinelli, in his *Fungorum Fossilium Omnium*, published at Venice in 1898, in which are listed and described about 400 species, included in about 70 genera. The lichens are almost unknown as fossils. Those found are apparently referable to living genera; they consist mostly of flakes on fragments of lignite or are inclosed in amber, and none is known from horizons below the Tertiary. The algæ are represented by the earliest known definite traces of vegetable organisms, even if all the problematic casts and tracings which have been referred to these plants are eliminated. Many of these latter to which generic names have been given may be considered as mere mechanical markings, such as are made by ripples, sun or frost cracks, etc., or by the tracks or burrows of marine animals. In the former class may be included the genera Eophyton, Vexillum, Goniophycus, etc., and in the latter, Scolithus, Phytopsis, Bilobites, etc. Nevertheless, if all these uncertain forms are disregarded, a large number of fossil species are known, which are apparently referable to the larger marine algæ, and are included in the genera Buthotrephis, Lierophycus, Nematophycus, Lithothamnion, Chondrites, etc., which occur in rocks of all ages from the Cambrian upward.

The diatoms are the most abundant as well as the most perfectly preserved of all the thallophytes, their siliceous tests generally retaining perfectly their original characters. They occur in abundance from the Cretaceous period upward, often forming extensive beds of 'tripoli' or diatomaceous earth, such as those of Bilin in Bohemia and Richmond in Virginia. (See DIATOMACEÆ.) With very few exceptions, the genera of fossil diatoms are identical with those now living, and the same is true of a large number of species. The Characeæ are represented in the fossil state mostly by minute spheroidal bodies which are supposed to be the fruit cases or oögonia of species of Chara. They have been found in rocks of Devonian age in North America and are quite common in those of the Jurassic and Tertiary periods, where they are occasionally accompanied by fragments of stems.

THE BRYOPHYTES. Our knowledge concerning fossil bryophytes is practically confined to a small number of remains found in the Tertiary and more recent deposits, all of them either identical with or closely allied to living species. The Hepaticæ are represented by about twenty fossil species. Several in the genus Marchantia have been described from the Tertiary rocks of Europe, and one from the Eocene rocks of Montana. The mosses occur sparingly as fossils, and have been satisfactorily identified only in Tertiary deposits.

THE PTERIDOPHYTES. The rise and decline of this sub-kingdom of plants comprises one of the most remarkable chapters in the life history of the earth. Pteridophytes probably originated in the Lower Silurian period, although their earliest well-defined remains are from the Devonian. During the Carboniferous period they attained a position which, in respect of actual and relative numbers and high degree of development as a type, has no parallel in the vegetable kingdom; but since that period the sub-kingdom as a whole has steadily declined numerically, and it has also undergone profound biologic degeneration. The ferns are probably the best known of the fossil pteridophytes. They were important elements in the Devonian flora, and reached a maximum of development in the Carboniferous period, at which time they apparently formed about 50 per cent. of the entire flora; they declined to about 30 per cent. in Mesozoic time, and in Cenozoic time to less than 6 per cent. All the Paleozoic genera (Neuropteris, Pecopteris, Sphenopteris, etc.) are extinct, and so probably are most of those of Mesozoic time, although a number of the latter are considered to be identical with living ones. Tertiary forms are generally regarded as generically and in many cases specifically, the same as existing forms.

Rhizocarps, inconspicuous both in size and in numbers at the present time, are but poorly represented as fossils, even if all doubtful forms are included. They probably made their first appearance during Devonian time. A number of undoubted species of Salvinia are known from Cretaceous and Tertiary deposits of North America and Europe. The Equisetum type had its beginning in the Devonian, and perhaps earlier. The remains consist of trunks or stems, leafy branches or fructifications, which are known under the generic names Calamites, Calamodendron, Asterophyllites, Calamostachys, etc. They attained their maximum of evolution during the Carboniferous period, at which time they formed probably 10 per cent. of the flora. These genera became extinct at the close of Paleozoic time and were succeeded by the Mesozoic genera Schizoneuron, Phyllotheca, etc., and Equisetum, which latter has continued, through forms which steadily decreased in numbers and size, down to the present time.

Lycopods were represented very early in geologic time, probably in the Upper Silurian period or even earlier, but reached their highest development during the Carboniferous, contributing about 15 per cent. to the flora of that period. Their remains are represented mostly by trunks and limbs, under the generic names of Lepidodendron, Lepidophloios, Knorria, etc.; by the fruiting spikes, under Lepidostrobus; by foliar organs, under Lepidophyllum, etc. These genera became extinct at the same time with the other pteridophyte genera of Paleozoic time, and were succeeded by degenerate descendants which are either identical with or closely related to the living genera Lycopodium and Selaginella.

PLANTS OF DOUBTFUL RELATIONSHIP. In this connection it is necessary to mention several important types of vegetation whose exact botanical affinities are not definitely known. It is probable that some of these may represent synthetic types which combine characters belonging to both the pteridophytes and the gymnosperms, and they may, therefore, be properly considered between the discussion of these two groups. The Cycadofilices are plants which, in the present state of our knowledge, may belong either with the cycads or with the ferns, such as those included in the genera Hoeggerathia, Thinnfeldtia, etc. The important Paleozoic genus Sigillaria, with its rhizomes known as stigmaria, has been thought possibly to represent a type intermediate between

the lycopods and the gymnosperms, while the genus Sphenophyllum is one which has never been satisfactorily classified botanically.

The Spermatophytes. The earliest definite remains of plants of this sub-kingdom thus far recorded in America belong to the Devonian period, but in Europe they probably date as far back as the Upper Silurian. They developed slowly until Mesozoic time, when, as gymnosperms, they became the dominant type of vegetation, and from then onward, as angiosperms, they continued their upward development to the present time.

The gymnosperms were the earliest representatives, of which the extinct genera Cordaites, Gingkophyllum, etc., may be considered as original types. As a class they were of relatively little importance numerically until the close of the Carboniferous period, when both cycads and conifers began to develop rapidly, and in early Mesozoic time these plants formed together more than 60 per cent. of the entire flora. This was the period of maximum development of the cycads in particular, after which they declined, and are now a rare and unimportant element in the living flora. The conifers apparently originated before the cycads; their development was more uniform and they continued to be important factors in the vegetation of both Mesozoic and Cenozoic time, as they are yet in the living flora. Genera such as Baiera, Araucarites, etc., closely allied to our Ginkgo and Norfolk Island pine, were in existence in the Jurassic and early Cretaceous periods, and these were followed by undoubted living genera, such as Sequoia, to which the giant trees of California belong; Pinus, which includes our common pines, etc. As a whole, the conifers have continued to decline in relative importance ever since the early part of the Cretaceous period.

The angiosperms may have had their origin in the Carboniferous period, but the few supposed Paleozoic forms described are very doubtful. Toward the close of the Jurassic period this class of plants was abundantly represented, and in the Cretaceous it rapidly developed into the dominant type, which position it has maintained ever since. In regard to the monocotyledons we know but little. The time of their first appearance is not definitely established, and it was not until the palms made their appearance in the Upper Cretaceous that they assumed any prominence. Grasses and sedges probably preceded the palms, but their remains have mostly been found in rocks of Tertiary age, during which period the class, as a whole, may have contributed about 10 per cent. of the entire flora.

It is probably in connection with the dicotyledons that the greatest interest centres. Their origin is traced to certain archaic forms in the Jurassic and Lower Cretaceous deposits of North America and Europe, to which Saporta has given the name of proangiosperms. Some of these from the Potomac formation of Virginia suggest, superficially, a blending of the monocotyledons and dicotyledons, as seen in the genera Acaciæphyllum and Proteæphyllum. Others, like Protorrhipis, Braseniopsis, etc., have certain characters suggestive of relationship to those few dicotyledons which, in common with the monocotyledons, possess an endogenous structure, and of which Nymphæa, Nelumbo, etc., are examples. Apparently the dicotyledons attained their high degree of development, both biologically and numerically, more rapidly than did any one of the types of vegetation which preceded them. In the Middle Cretaceous they had become the dominant type, and they have continued so to the present time. Among the earliest identifiable genera are many whose relationship with living genera is more or less clearly defined, as indicated in the names Populophyllum, Quercophyllum, Saliciphyllum, etc., while these were followed by others like Sassafras, Platanus, Liriodendron, Magnolia, etc., which it has been found impossible to separate generically from those now in existence. Living species have been recognized as far back as the Eocene and the Tertiary, and in the Quaternary period it is probable that all were identical.

Bibliography. The following may be cited as general compends, text-books, and works of popular interest on the subject. Dawson, *The Geological History of Plants* (New York, 1888); Knowlton, "Fossil Plants as an Aid to Geology," in *Journal of Geology*, vol. ii. (Chicago, 1894); Potonie, *Lehrbuch der Pflanzenpaläontologie* (Berlin, 1899); Saporta, *Le monde des plantes avant l'apparition de l'homme* (Paris, 1879); Saporta and Marion, *Origine paléontologique des arbres*, etc. (ib., 1888); Schenk, *Die fossilen Pflanzenreste* (Breslau, 1888); Schimper, *Traité de paléontologie végétale* (Paris, 1869-74); Schimper and Schenk, *Paléophytologie*, being part ii. of Zittel's *Handbuch der Paläontologie* (Munich and Leipzig, 1890); French translations of same by Barrois (Paris, Munich, and Leipzig, 1891); Scott, *Studies in Fossil Botany* (London, 1900); Seward, *Fossil Plants as Tests of Climate* (ib., 1892); Seward, *Fossil Plants for Students of Botany and Geology* (Cambridge, Eng., 1898); Von Solms-Laubach, *Einleitung in die Paläophytologie*, etc. (Leipzig, 1887); Von Solms-Laubach, Garnsey, and Balfour, *Fossil Botany, Being an Introduction to Palæophytology from the Standpoint of the Botanist* (Oxford, 1891); Unger, *Synopsis Plantarum Fossilium* (Leipzig, 1845); Unger, *Genera et Species Plantarum Fossilium* (Vienna, 1850); Ward, "Sketch of Paleobotany," in *Annual Report of the United States Geological Survey*, vol. v. (Washington, 1885); Ward, "Principles and Methods of Geologic Correlation by Means of Fossil Plants," in *American Geologist*, vol. ix. (Minneapolis, 1892); Ward, "The Geographical Distribution of Fossil Plants," in *Annual Report of the United States Geological Survey*, vol. viii. (Washington, 1889); Zeiller, *Eléments de paléobotanique* (Paris, 1900).

PALEOGRAPHY (from Gk. παλαιός, *palaios*, ancient + -γραφία, *graphia*, writing, from γράφειν, *graphein*, to write). In its widest signification the science which treats of the writing of the ancients and that of the Middle Ages. It includes within its scope the study of all marks or characters which may be designated as writing, whether on materials regarded as indestructible or as destructible. The term is commonly used, however, in a more restricted sense, and denotes the science which treats of writing on destructible material. Hence we may define Greek and Latin paleography as that branch of the general science of paleography which is concerned with the writing of those languages, found on such material as wax, papyrus, parchment, and paper, and dating from the earliest times. Historically, the

science of Latin paleography owes its origin to the demands of diplomatics, or the study and criticism of ancient legal documents. Gradually paleography assumed an importance of its own, and finally became a distinct science when the importance of diplomatics diminished after the French Revolution. The interest aroused by Latin documents led to the study of Greek paleography, through the investigation of the writings of the Greek Church Fathers. The field of Greek paleography is limited in comparison with Latin paleography, as the Greek letters were used for only one language, but the Latin alphabet served for the whole of Western Europe.

Letters and Their Forms. Letters may be classed in a general way as majuscules and minuscules. The former are either capitals or uncials. Capitals are either square, such as are found in the most carefully made inscriptions, or rustic, which are drawn with greater freedom with cross strokes oblique and short. Uncials are modified capitals arising from the favoring of curves and avoiding of angles inasmuch as they are the production of the pen on papyrus. Minuscules are the result of the rapid and inartistic writing of majuscules, which have been changed in form and size. The forms of letters were also influenced by the material upon which they were written. Those made on soft substances show curved lines, while letters on stone or metal are angular.

Materials. The materials used by mankind for purposes of writing have varied much. Leaves and bark were employed in a primitive state of society. Linen was used by the Egyptians and by the Romans for their religious books. Clay was inscribed or stamped by the people of Babylonia, Assyria, and Egypt, and by the Greeks and Romans. Bronze was used by the Romans for legal documents, such as the *diplomata*, giving privileges of citizenship and legal marriage to the soldiers, and lead served also for documents and dedicatory inscriptions. Stone inscriptions belong to the science of epigraphy. Wax tablets were used by the Greeks and Romans for writing purposes, a use which continued through the Middle Ages and down to modern times, as in the fish markets at Rouen. These were made of wood or ivory in a rectangular form and had a smooth surface slightly sunk and bordered by a rim. The surface was covered with black wax in which the writing was drawn by means of a stylus, a sharp-pointed instrument of bone, ivory, or metal. These tablets might be used singly, or two or three could be bound together. Many wax tablets have been found, as in the mines of Dacia, which date from A.D. 131 to 167, and at Pompeii dating from A.D. 15 to 62. Papyrus (q.v.) was very commonly used as a writing material in Egypt, Greece, and Italy. Papyrus rolls found at Herculaneum, which was destroyed A.D. 79, preserve the earliest Latin writing on this material. Next in date are the deeds of Ravenna, running from the fifth to the tenth century A.D. Of the fifth century are the fragments which contain rescripts written in a Roman cursive and addressed to Egyptian officials. The use of papyrus continued through the Middle Ages to some extent for literary works and regularly for Papal documents down to the eleventh century. Parchment (q.v.) was first employed by the Greeks and Romans simply as a cover for the rolls of papyrus, and its use for books dates from the latter part of the first century A.D. The term used in modern times for any kind of skin book is vellum, which properly designates calfskin. Vellum was employed until the fourteenth century, when paper made from rags generally took its place. Paper made from cotton had been used for Greek manuscripts in the thirteenth century. As suggested above, papyrus assumed the roll form, or *volumen* proper. Parchment, on the other hand, was made up into book form in imitation of the wax tablets.

Greek Paleography. The science of paleography as applied to the study of Greek writing on papyrus is of modern date. Greek papyri were discovered at Herculaneum in 1752, and in 1778 forty or fifty rolls were found in Egypt, which with one exception were afterwards destroyed. In 1820 a large number belonging to the second century B.C. were found at the Serapeum in Memphis. During the next thirty years there were discovered at intervals important literary papyri, as in 1821 the Bankes *Iliad* (the last books), in 1847 orations of Hyperides, and in 1849-50 the Harris Homer (parts of *Iliad* xviii., and in book form, books ii.-iv.). Far more important discoveries were to follow. In 1877 many fragmentary papyri of a more literary character belonging to the Byzantine period were unearthed at Arsinoë in the Fayum district. In 1892, at Socnopaei Nesus, in the same district, another group was found containing documents ranging from the beginning of the first century A.D. to the middle of the third. In 1889-90 Flinders Petrie found that the cartonnages of mummy coffins at Gurob were made of papyri, written in the third century B.C., which proved to be fragments of documents and of literary works, among them part of the lost *Antiope* of Euripides. Fortunately, some papyri were also deposited with the dead, and were thus preserved in fairly good condition. Among these were the *Constitution of Athens* of Aristotle, the Mimes of Herondas, the oration of Hyperides against Athenogenes, and portions of the odes of Bacchylides. In 1896-97 Grenfell and Hunt, acting for the Egyptian Exploration Fund, discovered at Behnesa, the ancient Oxyrhynchus, thousands of papyri, fragments of literary works, and complete rolls of non-literary character. Among these were the famous Logia or sayings of Christ, parts of the Gospel of Matthew, and pieces from classical writers. They range in date from the first to the seventh century A.D. Previous to these discoveries it was customary to classify Greek papyri according to the style of writing as the literary or book hand or, again, the cursive. Although these differ in their general style, there is no set form for each. Writing on vellum may be classed as uncial and minuscule, and this distinction can be sharply drawn in the Middle Ages, when the literary hands were settled. This is not true, however, of the papyrus period, for it is impossible to distinguish uncials and minuscules, both of which may be written cursively. The uncial of the medieval period is a lineal descendant of the literary style in the papyri, but the mediæval minuscule is a new letter, based on the cursive, but molded into an exact form and becoming finally the regular hand of the literary style. Three periods in the history of Greek writing on papyrus may be recognized. These correspond to political changes

The Ptolemaic, B.C. 323-30, marked by freedom and breadth of style; the Roman, from Augustus to Diocletian, marked by roundness and curved, flowing strokes; and the Byzantine, from A.D. 360 to the Arab conquest of Egypt in 640, marked by a large, handsome style.

It is possible that the earliest extant example of writing on vellum is an Egyptian fragment of two leaves containing part of Demosthenes's speech, *De Falsa Legatione*, in a hand like that of the Herondas papyrus, written perhaps in the early part of the second century A.D. This is a rare example, and we do not find a rapid increase in the use of vellum until the fourth century, when literary works on papyrus are almost entirely lacking and its place was taken by vellum. The oldest vellum manuscripts, excepting the fragment of Demosthenes, are the great uncial codices of the Bible, the Codex Vaticanus and the Codex Sinaiticus. Manuscripts written in Greek minuscules are numerous. They are classified as the *retustissimi*, from the ninth to the middle of the tenth century; the *retusti*, from the middle of the tenth to the middle of the thirteenth century; the *recentiores*, from the middle of the thirteenth to the middle of the fifteenth century; and the *novelli*, all of later date. These show a varying style of minuscule, the earliest being the most simple and exact.

Latin Paleography. In studying the history of Latin paleography, we begin with majuscule writing as found in the earliest Latin manuscripts extant, such as the Vergil of the fourth century. Uncials described above may be recognized in Latin paleography by the letters € and Φ, and also by rounded forms of D and H. As a literary hand the uncial writing runs from the fifth to the eighth century. The cursive hand generally used influenced the more limited literary majuscule hand, so that a style designated the half-uncial finally became the book hand. The earliest examples of the cursive style are the wall inscriptions and wax tablets of Pompeii, written before A.D. 79. The style of writing differed very slightly in the first three centuries of the Christian Era. From the cursive hand came the so-called national hands, which assumed an individuality according to the locality in which they held sway. The Lombardic is the writing of Southern Italy as practiced in the monasteries of Monte Cassino and La Cava, and lasted from the ninth to the thirteenth century. The Visigothic was employed for books and documents in Spain from the eighth to the twelfth century. The Merovingian appears as a book hand on manuscripts of the seventh and eighth centuries. It never reached the calligraphic form, which marked the highest development of the other national hands, for it was supplanted by the round minuscules of the Carolingian reform. The Irish and Anglo-Saxon writing must be mentioned apart from the national hands, for it was not derived from the cursive style, but from the half-uncial which was brought to Ireland by the missionaries in the sixth century. One important peculiarity of the Irish hand is the tendency to calligraphic forms and ornamentation of the manuscripts, as in the famous Book of Kells of the latter part of the seventh century. The Irish hand found its way into the northern part of Britain, so that the English hand may thus be traced to the Roman half-uncial.

The reform of writing which marked the reign of Charlemagne was initiated by a decree of 789 for the revision of Church books. It had its origin in the monasteries of France, particularly at Tours, where, in the Abbey of Saint Martin, under the direction of Alcuin of York, much attention was given to writing. A new hand was the result, which is known as the round Caroline minuscules. These are small uncials of the true Latin form modified by cursive influences, and they became the literary hand of the Frankish Empire. In the tenth century these minuscules began to spread, and in the eleventh century they began to assume their individual form in various nations of Europe. This was the starting point of the history of modern hands, which are traced to the Roman alphabet. In the twelfth century the so-called Gothic writing appeared, which is simply the Caroline minuscule with angles replacing the curves. The writing of the fourteenth century shows a gradual decline and the letters become less distinct and are less carefully made. Nevertheless, a renaissance in Italy in the fourteenth century gave a very regular and beautiful style—the humanistic hands of the fifteenth century, which had great influence on the type forms. These minuscule letters were the ancestors of the lower-case letters of the Roman alphabet, and the Gothic form of the same gave the German lower-case letters.

Bibliography. The most convenient handbooks are: Thompson, *Handbook of Greek and Latin Palæography* (London, 1893); Reusen, *Eléments de palæographie* (Paris, 1897); Prou, *Manuel de palæographie latine et française* (ib., 1892); and Paoli, *Programma scholastica di palæografia latina e di diplomatica* (Florence, 1884-94). For facsimiles, the large series of facsimiles of the Palæographical Society (London, 1873 et seq.) are of great value; also Vitelli and Paoli, *Collezione fiorentina di facsimili palæografici greci e latini* (Florence, 1884-96).

For Greek Paleography: Gardthausen, *Griechische Palæographie* (Leipzig, 1879); Wilcken, *Tafeln zur ältern griechischen Paläographie* (Berlin, 1891); Altenbach, *Anleitung zur griechischen Palæographie* (3d ed., Leipzig, 1895); and as an introduction to the subject of Greek papyrus paleography, Kenyon, *The Palæography of Greek Papyri* (London, 1899). Facsimiles for general study of Greek paleography are: Omont, *Facsimiles des plus anciens manuscrits grecs en onciale et en minuscule de la Bibliothèque Nationale du IVème au XIIème siècle* (Paris, 1892); id., *Facsimiles des manuscrits datés de la Bibliothèque Nationale du IXème au XIVème siècle* (ib., 1890); id., *Facsimiles des manuscrits grecs des XIème et XIIème siècles* (ib., 1887); Wattenbach and von Velsen, *Exempla Codicum Græcorum Litteris Minusculis Scriptorum* (Heidelberg, 1828); id., *Scripturæ Græcæ Specimina* (Berlin, 1883).

For Latin Paleography: Delisle, *Album palæographique* (Paris, 1887); Wessely, *Schrifttafeln zur ältern lateinischen Paläographie* (Leipzig, 1898); Monaci and Paoli, *Archivio paleografico italiano* (Rome, 1882-1890). Old and standard works are: Silvestre, *Palæographie universelle* (London, 1850); Champollion-Figeac, *Chartes latines sur papyrus* (Paris, 1835-40). For facsimiles, Arndt, *Schrifttafeln zur Erlernung der lateinischen Palæographie*, 3d ed., by Tangl (Berlin, 1897-98); Zangemeister and Wattenbach, *Exempla Codicum Latinorum Litteris Minusculis*

Scriptorum (Heidelberg, 1876-79); Chatelain, *Paléographie des classiques latins* (Paris, 1884-96); id., *Uncialis Scriptura Codicum Latinorum Novis Exemplis Illustrata* (ib., 1901).

For abbreviations: Walther, *Lexicon Diplomaticum* (Ulm, 1756), is still the standard work. Chassant, *Dictionnaire des abbréviations* (2d ed., Paris, 1884), is a convenient handbook. Consult also: Allen, *Notes on Abbreviations in Greek Manuscripts* (London, 1889); Cappelli, *Dizionario di abbreviature latine ed italiane* (Rome, 1899); and for English documents, Martin, *The Record Interpreter* (London, 1892).

PALEONTOLOGY (from Gk. *παλαιός, palaios*, ancient + *ὄντα, onta*, pl. of *ὤν, ὄν*, being + *-λογία -logia*, from *λέγειν, legein*, to speak). The science which deals with the ancient life that has inhabited the earth during the past periods of geological time. It is based upon the study of fossils, and has close affiliations with geology, physiography, and biology. It embraces, under a broad conception of its scope, not alone the description and classification of fossils, but also all questions relating to the nature, morphology, and physiology, biomony and ecology, geologic and geographic distribution, and to the ontogeny, evolution, and phylogeny of all forms of plant and animal life that have lived upon the earth and that are now found, in more or less well-preserved condition of fossilization, imbedded in the rocks that form the earth's crust. Paleontology is the history of the organic life of the earth from its inception in remote geologic time to its culmination in the vegetable and animal life of the present era. This science was founded on an independent basis by Lamarck, Cuvier, Schlotheim, Sowerby, Parkinson, D'Orbigny, and Goldfuss about the beginning of the nineteenth century, and most of the early paleontological literature dealt with mere descriptions and classifications of fossils. After the publication of Darwin's *Origin of Species* in 1859, and the subsequent elaboration of the doctrine of evolution, it became evident that proof of this doctrine must be furnished largely by the paleontologists, and the study of fossil organisms received a new impetus along those lines of research which bear upon the broader philosophical questions of the origin, evolution, and phylogeny of the various species and races of fossil animals and plants. Quite coördinate with this development of the biological phase of paleontology has been the elaboration of that phase of the science which is more closely allied to geology; namely the more refined methods in the use of fossils as markers of geologic horizons, the investigation of the succession, migration, and evolution of fossil faunas and floras, and the determination of the physiographic changes and other causes of such phenomena.

Two lines of paleontological research may then be recognized. Certain investigators confine their attention almost entirely to the elucidation of the morphology, embryology, ontogeny or development, and phylogeny or genealogy, and to the description and classification of organic remains, noting the names only of the geological formations whence the species have been derived. Such studies fall within the scope of paleobotany and paleozoölogy, which are essentially branches of biology. The other phases of the science of paleontology, and perhaps the more comprehensive of the two, may be designated as paleontologic geology, stratigraphic paleontology, geological biology, and deals with the relations existing between the fossils and the rocks in which they are found. It is practically that part of historical geology which is based upon the study of fossils. Under this head are embraced the following lines of investigation, and also others not mentioned that are of more special interest: (1) The use of index fossils as markers of geological formations and horizons; (2) the assemblage, within individual formations, of species and genera of fossil plants and animals to constitute paleofloras and paleofaunas; and the study of the succession, migration, and evolution of these ancient floras and faunas, and their relations to the grander divisions of geologic time; (3) the development of facies, and the influence of the facies on the conditions of existence of the life of ancient times; (4) the study of paleogeography, comprising the determination of the physiographic and climatic conditions existent during the successive periods of the earth's history. All these latter lines of investigation, however closely related in their final results to the physical side of geology, nevertheless depend for their successful pursuit upon intimate knowledge of the purely biological aspects of paleontology, for they are based primarily upon keen discrimination between allied species and upon recognition of the phylogenetic relationships of the species involved.

Fossils. The nature of fossils and the modes of fossilization are described in the article Fossil. Not all animals and plants of past time have been preserved to us as fossils. A large number of them were of such organization that they were hardly likely to leave traces of their existence in the rocks. It is also known that many formations which originally contained fossils have suffered so great metamorphism that their organic contents have been wholly or partially destroyed. Other formations have been upheaved above the level of the ocean to form part of the land and have been subjected to erosion, with the result that their materials have been carried down to lower levels or into the sea, there to build up deposits of later age. Yet, in spite of the many gaps which will probably never be filled, the history of organisms is being rapidly compiled with an increasing degree of continuity in the series of life epochs, the lines of descent of many races of animals and plants have been established, and the sequence of those events in geological history that bear upon the conditions of existence of extinct faunas has been worked out for several portions of the earth's surface, and with a surprising degree of detail.

Through observation of the true order of superposition, the rocks of the earth's crust have been arranged by geologists into a series of systems, stages, and formations, the lowermost being the oldest and the uppermost the youngest, and the relative succession of the individual members of this series has been determined to be the same in all parts of the world. The fossils of the different members of the series have been studied and described, and it has been ascertained that the assemblage of fossils found in one formation always differs more or less from the assemblage of fossils found in the overlying and underlying beds, and furthermore that the difference is accentuated as the distance between the formations is increased. For table of geological formations, see GEOLOGY.

Faunas. The fossils contained in a rock formation are in general indicative of the animal and vegetable life that lived during the period of time in which that rock was deposited. Successive faunas and floras of variable expression have succeeded each other on the earth and have left their remains in the rocks that were forming during the periods of their existence. The large divisions of time are distinguished by the predominant types of life, as the Paleozoic era by invertebrates, the Mesozoic era by reptiles, etc., and the smaller periods of time, represented by the stages and substages, are characterized by particular genera and species. Thus the Helderbergian series is identifiable by the brachiopod genus Gypidula, and a division of that series, the Coeymans limestone, is recognizable by the presence of *Gypidula galeata* a well-marked species that serves for the identification of that horizon in many parts of America. Such a characteristic genus or species, which can be relied upon for the recognition of geological horizons or zones, is called an index fossil, and its use is the result primarily of careful observation in the field. This empirical usage of index fossils is that adopted by geologists who have not been trained in the methods of paleontological research. There is a second and more important usage of index fossils based upon a knowledge of the phylogeny of races of animals and plants. By recognition of the phyletic position of a fossil the expert paleontologist can determine within close limits the relative age of the rock from which the fossil was obtained.

Indigene and Exotic Faunas. In a single basin it is sometimes found that a series of similar faunas, evidently evolved each from its predecessor in this basin, is eventually succeeded at a higher horizon by a new fauna totally different from those below. The lower faunas are the indigene faunas, developed or evolved in this province through a long period of time and consisting of members nicely adapted to their environment and to each other. The new fauna, generally associated with a change of sedimentation, is called an alien or exotic fauna, and it has invaded this region in consequence of physiographic or climatic changes. It may find itself in congenial surroundings, and its species will then multiply and evolve, and if left undisturbed it will in turn become the indigene fauna of the region. But if its new environment happens to become uncongenial it may suffer partial extinction of its members or suppression of development of its individuals, and it will remain in the region for a short time only, to be succeeded by another alien fauna or by a returning party of the original indigene fauna. The migrations of faunas are largely due to changes in the 'facies' consequent upon physiographic and climatic changes.

Facies Development and Bionomy. Facies is the combination of physical and biological characteristics exhibited by a geological formation at a particular point. These are determined at the present time by climate, depth, tides, nature of medium, distance from shore, etc. (see Distribution of Animals; Ecology; Fauna; Flora), and just as different types of facies are being developed in the ocean and on the land at the present time, so they have been developed during all past periods of geological history. It follows then that the deposits formed during any one period may be represented in different regions by littoral, sublittoral, abyssal, corallic, estuarine, lacustrine, or terrestrial facies, and each of these facies will have its own distinctive fauna. Study of the life habits of modern organisms enables us to restore the habits of extinct forms of life, and we are able to portray with a considerable degree of correctness the conditions under which the ancient faunas lived, and consequently also to picture the physiography of past times. The large majority of fossiliferous rocks are of marine origin, and hence a study of modern marine organisms is essential to a proper understanding of the bionomic conditions of the past. Freshwater and terrestrial deposits are also claiming more attention than they formerly received; they with their peculiar faunas and floras occur chiefly in the Mesozoic and Cenozoic formations.

Bionomy. Marine organisms are broadly divided into pelagic, or those that inhabit the open sea, and littoral, those that live in the vicinity of the coasts. According to their modes of life they are divided into plankton, nekton, benthos.

Plankton includes the majority of pelagic organisms that are more or less passively drifted about by the waves and currents of the ocean. Many organisms are planktonic only during their larval stages and when adult become attached and adopt a benthonic life (meroplankton). Such are sponges, medusæ, annelids, echinoderms, brachiopods, bryozoans, most mollusks, and Crustacea. Others are planktonic throughout their lives, as Foraminifera, Radiolaria, Siphonophora, Ctenophora, Chætognatha, Pteropoda, Heteropoda, and some crustaceans. Planktonic organisms are generally widely distributed and their fossil remains occur principally in the sublittoral and abyssal facies, though they may be found in the littoral facies.

Nekton includes the organisms that are active swimmers independent of storms, currents, and tides. Here are included fishes, most malacostracan crustaceans, the dibranchiate cephalopods, and also the marine reptiles, including the extinct ichthyosaurs, plesiosaurs, Pythonomorpha, and the cetaceans.

Benthos includes all forms which live at the bottom, and of which there are recognized two sub-groups: the sessile and the vagile benthos. The benthos includes by far the larger proportion of marine organisms that are found in a fossil state. Among them are the marine algæ, some foraminifers, sponges, hydroids, corals, echinoderms, worms, brachiopods, bryozoans, gastropods, lamellibranchs, cirripedes, tunicates, and many cephalopods, such as the orthoceratites and belemnites. Radial symmetry is most highly developed in the sessile benthos (corals and echinoderms).

Littoral Facies includes deposits formed on the beach and in the shallow sea in the vicinity of the coast. They consist mostly of terrigenous materials ranging in size from fine mud, through sand to coarse conglomerate, and some kinds of organic deposits. The coarse beds contain few fossils, but those of finer grain abound in them. Fossils of the littoral facies comprise remains of the organisms that inhabited the shallow water and the region between tides; also those of the beach, and others that have drifted in to shore from the open sea. The majority of the fauna is made up of benthonic forms and all the animals and many of the plants have strong cal-

careous skeletons. Certain types of mollusks are characteristic of the littoral zone; oysters, mussels, the heavy clams, limpets, chitons, Littorina-like shells, the boring lamellibranchs, and here belong also the coarse marine algæ, crabs, and anomurans. The littoral facies is the most important of all, for most of the fossiliferous rocks have been formed in the shallow water near the shore and on the continental shelf, and also because preëminently, in its peculiar development of corallic facies, it contains the largest fauna.

Sublittoral Facies includes those deposits formed in the deeper water at a distance from the coast. It merges on the one side into the littoral and on the other into the abyssal facies. It contains the remains of pelagic (plankton and nekton) organisms which after death have sunk to the bottom, and also of those benthonic organisms of the deeper waters. Here are included fish, ammonoids, pteropods, graptolites, many foraminifers, radiolarians, and many echinoderms, mollusks, and brachiopods of more delicate build than those found in the littoral facies. Many of the pelagic organisms enjoyed very wide distribution, as the graptolites, and hence afford excellent index fossils for correlative purposes. Examples of sublittoral facies are the graptolite shales of the Ordovician, goniatite, and ammonite limestones and shales of the Upper Paleozoic and Mesozoic, and many pteropod limestones, like the Styliolina limestone of the Devonian.

Abyssal Facies. Here are included the deposits of the deep sea, consisting of very fine grain sediments of various types. (See Ooze.) The existence of abyssal sediments among the rocks of the earth's crust has been strongly denied by some writers. It is, however, difficult to assign certain geological formations to any other category. Such are the chalk deposits of the Cretaceous, the Upper Paleozoic radiolarian cherts of New South Wales, and those of Jurassic age in the Alps, and the Aptychus shales of the Alps, all of which are very similar to the abyssal deposits of the present day.

Corallic Facies. This is really a phase of the littoral facies, but as its characteristics are so distinct, and as its development depends upon the absence of many of those features associated with the normal littoral facies, it deserves special consideration. The conditions under which corals form reefs at the present time are a warm temperature, shallow water not more than 125 feet deep, and pure sea-water entirely free from mud and from inflowing fresh water. The other organisms living about the coral reef require the same conditions. These conditions existed also during the formation of the Paleozoic and Mesozoic and Tertiary coral reefs, for the rocks of these fossil reefs are free from traces of mud and clay.

Estuarine Facies embraces the deposits and faunas of lagoons and estuaries. The sediments are usually irregularly bedded muddy sands and clays. Here is found a commingling of brackish water types with marine organisms, fresh water and terrestrial types. A fine example of such an estuarine facies is afforded by the Lower Carboniferous nodule-bearing shales of Mazon Creek, near Morris, Ill., described by Meek and Worthen, Scudder, and others. The nodules have furnished a very large congeries of plants and animals. There are represented here ferns, amphibians, fish insects, spiders, scorpions, myriapods, eurypterids, crustaceans, aquatic worms, lamellibranchs of marine and fresh water types, gastropods of freshwater, marine, and terrestrial types. No strictly marine types, like crinoids and brachiopods, occur here, those present being species which could live in brackish water. Other examples of estuarine facies are found in the Carboniferous, Mesozoic, and Tertiary formations of Europe. In all probability many of the coal-measure swamps were of estuarine nature, for sections through the beds show alternations of marine and fresh or brackish water faunas.

Fresh-Water Facies appears first in the Carboniferous in the form of swamp deposits, now turned into coal. In these deposits are abundant fossil plants of various types, and remains of fresh water mollusks, insects, etc., and also of amphibians and fish. In the Mesozoic, and in more pronounced degree in the Tertiary, lacustrine deposits are largely developed. They may be recognized by their contained fresh-water shells; Paludina, Goniobasis, Planorbis, Limnæa, Unio, and Anodonta. They have afforded also the far more important and more interesting vertebrate remains, such as the dinosaurs, birds, and mammals. *Terrestrial facies*, represented by deposits of flood plain, desert, and prairie, do not as a rule afford many fossil remains. The loess, a recent accumulation of dust and river mud, contains land and fresh-water shells; and the White River Miocene clays of Colorado, containing finely preserved vertebrates, are thought to have been accumulated largely as dust upon a Tertiary prairie.

Composite Facies. The fossil elements of a fauna may be distinguished as autochthonous, or those which naturally belong in the deposits where found and which have been buried where they lived or where they fell to the bottom; and heterochthonous, or those which owe their entombment to the agencies of currents or other means of transportation, and have been buried far from their natural habitats. The autochthonous fossils are the more reliable for zonal correlation, while the heterochthonous fossils indicate the nature of preëxistent faunas and the proximity of neighboring faunas of different facies.

Ancient Climate and Paleogeography. Climatic zones are thought to have existed as early as Cambrian time and to have continued through the Silurian and Devonian periods. The European and North American faunas of these periods can be separated into northern and southern types which are quite distinct, the various genera having representative species in each zone. The courses of oceanic currents have been indicated for the early and late Ordovician by Matthew and Ruedemann. Other evidence regarding the climate of the Paleozoic is derived from study of the distribution of the fossil coral reefs of the Silurian, and of the plants of the Carboniferous. The Silurian coral reefs are found in high latitudes and indicate rather warm temperatures for those regions, and the structure of the Carboniferous tree-trunks points to a remarkable uniformity of the seasons during that period. Neumayr has tried to demonstrate that the Jurassic and Cretaceous faunas show the influence of well marked climatic zones which extended in belts around the globe independent of the continental barriers, but his results have not been confirmed

by subsequent investigations. During the Tertiary, however, climatic zones certainly existed, as is indicated by the fossil floras and faunas, but a lowering of the temperature began during Eocene time in North America and during Miocene time in Europe, and culminated in the ice age of the Pleistocene. Various interesting attempts have been made by Neumayr, Suess, Chamberlin, and others to correlate the evolution of animals and plants with the changes of climate in past times.

It will be seen from what has been said regarding facies development that the study of the distribution and migration of fossil faunas leads to conclusions regarding the physical geography, paleogeography, of ancient times; these conclusions must of course be tested in the light of the evidence derived from the study of the tectonic features. Much has been accomplished in this field of research by Heer, Neumayr, Suess, De Lapparent, Canu, Smith, Chamberlin, Weller, Ortmann, Schuchert, Ulrich, and Clarke.

The Species and Genus in Paleontology. The early conceptions of species held by the botanists and zoölogists of the non-transformist school were held also by paleontologists. Each fossil species was considered to represent a distinct entity separate from its allies and specially created. At that time transitional forms between species were grouped as varieties under one or the other specific head, or were even in many cases thrown away and destroyed, as they interfered with the hard and fast delimitations sought after in the early classifications. Subsequently, as the evolution doctrine became better understood, these transitional individuals were recognized as affording examples of the variability of species, and they are now considered to be of equal importance with the norm of the species itself, as affording evidence upon the origin of new varieties. A fossil species differs from a living species in one important respect. The living species of the present day is distinguished by certain particular characters which differentiate it from its allies, certain physiological tests determine its individuality, and it has a more or less limited area of geographical distribution. The species of the paleontologist is a far different conception. In addition to its geographical distribution, it has geologic range; for it lived during the period of deposition of perhaps several successive formations, and it is represented in these formations by a series of fossil forms of more or less unmistakable continuity until it disappears at some higher horizon. The physiological tests are impossible, and hence the paleontologist must rely upon likeness of form and upon continuity of occurrence, and he groups under a single specific denomination those individuals which resemble each other in essential characters and which differ only in secondary characters. Some species were evidently very short-lived, others enjoyed long lives and underwent little if any change of form, while still others varied considerably during their periods of existence, and in their later stages present such wide departure from the original form that, were the intermediate transitory phases absent, they would be considered to constitute distinct species or perhaps event distinct genera. Examples of such series of variable species are furnished by the Planorbis of the Upper Miocene at Steinheim, Württemberg, described by Hyatt and Hilgendorff; the Paludinaus of the Lower Pliocene of Slavonia, described by Neumayr; the Ammonites of the *Oppelia subradiatus* type of the Jurassic limestones, studied by Waagen.

The existence of such series of transitional forms, the members of which occur in successive horizons and all of which have apparently been derived from an original common ancestor, forces recognition of the fact that the term species in paleontology is a very arbitrary one, and that the limitation of a species is determined not by any strictly definable form, but rather by the absence of transitional forms that would serve to link it through scarcely distinguishable grades of variation to its nearest ally. Two species found in formations of different ages, and now considered distinct, may through future discovery of intermediate transitional stages prove to be but the earliest and latest stages of a single race. The same principles are true with respect of genera, families, etc. (see Horse, Fossil), our conceptions of which change as intermediate forms are discovered, and as the gaps in the classification are filled up. The inevitable conclusion drawn is that species and genera and even the larger groups are mere stages in the life history of organisms, that they have no real existence in nature, and that they are arbitrary concepts of the stages of evolution attained by a race of organisms at a particular moment or during a more extended period of its history.

Persistent and Aberrant Types. Persistent or conservative types are common among fossils, and they include those types that have escaped all changes of environment, and also those members of an original stock which have not responded to the influences of changed environments, and which have perpetuated the characters of their more primitive ancestral type through several geological formations or epochs. Examples are found among the Foraminifera, Globigerina and Orbulina (Cambrian to recent); Nautilus among cephalopods (Ordovician to recent); Lingula, Crania, and Rhynchonella among brachiopods; and Cidaris among echinoderms.

Aberrant types, or forms in which organs have been developed to an extent not found in the other normal members of the group, are common among fossils. Eucalyptocrinus among crinoids, the Rudistæ, Pholadidæ, and Teredinidæ among pelecypods, Ampyx among trilobites, Triceratops and Naosaurus among reptiles, and the titanotheres among mammals, serve as examples. The most aberrant forms are usually found at the ends of short lines of descent, and they seem to mark approaching extinction of these side lines. They seem to indicate extreme adaptation of the organism to special modes of life and appear to have lost their powers of adaptation in other directions.

Generalized and Synthetic Types. In the early history of a subkingdom there is often found to be a group of fossil organisms which combine in more or less marked degree the characters that distinguish a number of distinct classes or orders of later date. Such a generalized type or synthetic group is considered to resemble closely if not actually to represent the ancestral type of the entire subkingdom. An excellent example is afforded by the Cystoidea of Cambrian and Ordovician origin, which combine the characters of the Crinoidea, Blastoidea, Asteroidea, and Echinoidea of later origin. (See

CYSTOIDEA; CRINOIDEA.) At a date after the Cystoidea and Blastoidea had become extinct, and after the Echinoidea had passed through a considerable amount of evolution, there appeared in the Triassic the isolated genus Tiarechinus, which resembles both the Blastoidea and the Echinoidea, and which thus constitutes a synthetic type between these two classes. The Phyllocarida form a generalized group connecting the Entomostraca and Malacostraca; the Merostomata, containing the Eurypteridæ and Limulidæ, connect the Crustacea and Arachnida (especially the scorpions); the suborder Condylarthra of Lower Eocene time contains the ancestors of all the later suborders of the Ungulata, and also presents characters resembling those of the Carnivora; and the Gnetaceæ are synthetic between the angiosperms and gymnosperms. Nearly all races of fossil animals that can be traced back through ancestral forms are found to have their origin in such groups of generalized types.

PALEONTOLOGY AND EVOLUTION. The causes of variability among species, the meaning and processes of evolution and natural selection, and the relations between evolution and classification are considered in other articles under those particular titles. The bearing of paleontologic research upon these subjects and some of the results attained deserve brief notice here, and for further information regarding these lines of research the reader is referred to the papers cited in the bibliography at the end of this article. The following lines of research have been distinguished: Auxology or Bathmology, the study of growth of organisms; Genesiology, the study of heredity; Ctetology, relating to the origin of acquired characteristics; and Bioplastology, dealing with the correlation of the ontogeny and phylogeny, or the stages of development with those of evolution.

EMBRYOGENY OF FOSSIL ORGANISMS. Embryonic shells of mollusks, brachiopods, and crustaceans are sometimes found as minute objects in highly fossiliferous shales and limestone. Some adult shells retain at their apices the form of the embryonic shell, and others, like the ammonites, have the young shell which hatched from the egg inclosed within the centre of their coiled disks. By examining large numbers of brachiopod shells of all sizes, Beecher and Clarke, and later Schuchert, were able to arrange the individuals of certain species in series according to size, and to show that they all were derived from an embryonic stage, called the protegulum, of very simple form, resembling the Cambrian genus Paterina. They have shown that members of all the families of brachiopods began their existence as paterina-like shells, and that the distinctive adult shapes have been attained through modifications in the mode of growth of the shell during the stages subsequent to the protegulum stage. Beecher has shown that members of the principal families of trilobites began their existence as embryonic forms, called the 'protaspis,' which is comparable with the protonauplius stage of the more primitive living crustacea. Among the corals, several fossil genera, as Favosites, Syringopora, etc. (fide Beecher and Girty), pass through an embryonic stage that resembles another fossil coral Aulopora. The nautiloid and ammonoid cephalopods present the most favorable conditions for the preservation of the embryonic stages of growth, because their shells hold within their centres all the successive stages through which they have passed in their ontogenetic development. By breaking open such a shell the developmental stages can be studied from the earliest "protoconch" hatched from the egg and found at the centre of the coil, to the senile or old age stage represented by the last chamber in which the animal lived. See CEPHALOPODA.

AGASSIZ'S LAW OF RECAPITULATION, subsequently termed by Haeckel the law of palingenesis, according to which the stages of development or ontogeny of the individual can be correlated with the stages of evolution or phylogeny of the race to which the particular individual belongs, has received abundant confirmative evidence from paleontology, and the literature on this and allied branches of research is quite formidable, especially in its technicality of expression. The following scheme of terms adapted from Hyatt has been devised to distinguish the corresponding stages:

Ontogeny, or Development		Phylogeny, or Evolution of Race Stages	
Colloquial	*Technical*		
Fœtal	Embryonic	Phylembryonic	
Baby	Nepionic	Phylonepionic	Epacme
Adolescent	Neanic	Phylacmeic	
Adult	Ephebic	Physephebic	Acme
Senile	Gerontic	Phylogerontic	Paracme

Fine illustrations of such correlations between ontogenetic and phylogenetic stages have been furnished by Hyatt's study of the Arietidæ, a group of ammonites; by Beecher's demonstration of the phylogeny of the Terebratellidæ, a family of brachiopods; and by Beecher's studies on the larval forms of trilobites. This palingenetic law is of much value to the stratigraphic paleontologist, for it enables him to correlate geological formations of which the faunas consist of wholly unknown species. It also enables him to postulate the existence in earlier formations of unknown genera which when found will prove to be counterparts of larval or adolescent stages of species already under observation.

ACCELERATION AND RETARDATION. In some cases the correspondence between the two classes of stages mentioned above is incomplete, through action of 'tachygenesis,' or 'acceleration of development,' which has been defined by Hyatt as follows: "All modifications and variations in progressive series tend to appear first in the adolescent or adult stages of growth, and then to be inherited in successive descendants at earlier and earlier stages according to the law of acceleration, until they either become embryonic, or are crowded out of the organization, and replaced in the development by characteristics of later origin." Examples are seen in the spiny larvæ of the trilobites Acidaspis and Arges, which differ greatly from the smooth protaspis stages of other trilobites. Retardation of development is the reverse of acceleration and is due to the later stages dropping out of the ontogeny; in other words, animals in which this operates grow old quickly. Examples are afforded by some Cretaceous ammonites which have sutures of goniatitic and ceratitic type. These ammonites are derived from Jurassic ancestors having complex sutures, but they never attained their normal development; they stopped growing in their youth. Similar cases have been noted among the brachiopods,

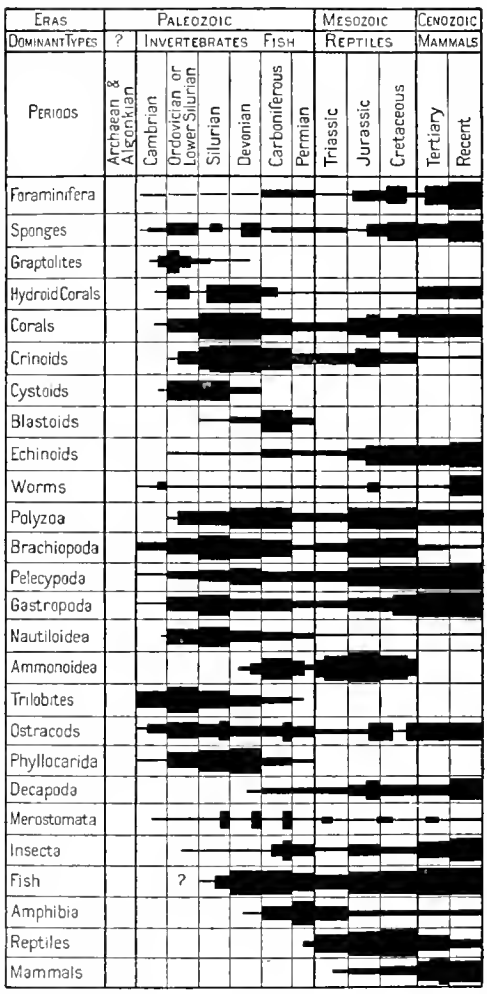
and the larval condition of many parasites may be explained in this manner. Retardation of acceleration results often in regressive evolution. These laws of acceleration and retardation explain disturbing factors in the application of embryogenic methods to elucidation of the past histories of the races of modern animals, and enable us to understand why the ontogeny of a living animal cannot always be depended upon to furnish a synopsis of the sequence of events that have occurred in the geological history of its phylum.

Ctetology (κτητός, something acquired). The question of the inheritance of acquired characters, one of the cardinal principles of evolution, has been denied by some zoölogists, and affirmed by most paleontologists. Hyatt, after tracing the genetic relations of varieties and species of fossil cephalopods through geologic time, came to the conclusion "that there is no class of characteristics which may be described as non-inheritable," and he has proved beyond any doubt the inheritance of one particular characteristic, namely the so-called 'impressed zone,' of the nautiloids, due to the adoption by the animal of a crawling mode of life, with its consequent influence upon the form of the shell. This impressed zone appeared first in the adult stages of early Paleozoic nautiloids, and through inheritance and acceleration it became fixed in successively earlier stages of growth in the succeeding nautiloids of the later Paleozoic.

Gerons and Phylogerons. When an organism has passed the acme of its development and begins to get old it sometimes acquires at that late date peculiar characteristics that seem to indicate loss of energy. The shells of mollusks and brachiopods thicken and the ornamentation decreases in prominence, etc. Among fossil cephalopods the last whorl often shows a tendency to uncoil. By acceleration these gerontic characters appear earlier in the ontogeny of succeeding species, and finally the normal closely coiled shell is found only in the very youngest stages of the phylogerontic members of the race.

Adaptation and Specialization. The manner in which many types of modern organisms have become adapted to their particular modes of existence is often well illustrated by their fossil ancestors, in which may be observed a gradual change in organization from earlier less specialized and less adapted types. One of the best known cases of gradual adaptation is that of the horse, whose one-toed hoof has become adapted from an original five-toed Eocene ancestor of generalized type. (See Horse, Fossil.) Some cases of adaptation to particular modes of existence reached a higher degree of perfection during past times than any known at the present day. There was a winged reptile, Ornithostoma or Pteranodon of the Cretaceous, in comparison with which the best of modern birds are mere tyros. This creature, with a body weighing not more than thirty pounds, had wings that spread twenty feet from tip to tip, and a skeleton so delicate that the bones are almost paperlike in structure. The cause of extinction of such a creature, which would seem to have been almost beyond the influences which are known to have caused the extinction of other races of animals, is as yet a mystery.

Extinction of Organisms. One of the most impressive phenomena brought to the attention of the student of paleontology is the extinction or disappearance of species, families, and even whole orders, as well as faunas, of fossil animals and plants. In some cases the rate of disappearance is gradual, the group diminishing in importance before final extinction occurs; in other cases extinction is sudden, as if due to some catastrophe. Extinctions of the latter type are usually associated with important changes in the sediments or with unconformities, and occur at levels which have been used to mark the limits of geological systems or formations. In many cases such extinction is only apparent, and is due to migration



Distribution of Important Groups of Fossil Animals.

of the fauna into some distant or unknown region. In some cases the extinction is very real, entire groups of animals having been, as it were, suddenly annihilated. Some types of organisms after having enjoyed a more or less extended period of life have slowly died out and have become extinct, apparently uninfluenced by any physiographic catastrophe, after having passed through a maximum period of evolution and a subsequent phylogerontic decline. They have grown old and died apparently through lack of growth force.

Without doubt the most far-reaching causes of extinction of marine animals during past times have been those changes in the relative levels of land and sea by which the water has been largely drawn off from the epicontinental shallow seas and from the continental shelf or littoral zone during intervals of isostatic readjustment. As a consequence of such readjustments, which also mark the openings of new geological periods, the faunas inhabiting the shallow seas have been driven into deeper water and have suffered annihilation, with the exception of scattered parties which found shelter in some harbors of refuge and thus served to furnish the nuclei for new faunas which evolved under future more favorable conditions.

Distribution of Organisms in the Past. Detailed information regarding the range of the various fossil animals throughout the geological formations is given in the articles on the separate groups and genera, and the range of fossil plants is described in the article Paleobotany. It is necessary here to give only a general view of the distribution of those groups of animals which are of most importance to the student of stratigraphic paleontology. The vertical divisions of the table represent geological periods, and the thickness of the black lines indicates the relative expansion of the groups. The selection of the group names is based entirely upon their importance as fossils and has nothing to do with their rank as members of a zoölogical classification.

Bibliography. Pictet, *Traité de paléontologie* (Paris, 1853-57); Owen, *Manual of Palæontology* (7th ed., London, 1871); Nicholson and Lydekker, *id.* (Edinburgh and London, 1889); De Lapparent, *Traité de geologie* (4th ed., Paris, 1900; Fischer, *Manuel de conchyliologie et de paléontologie conchyliologique* (Paris, 1888); Frech, *Lethæa Geognostica*, vols. i.-iii. (Stuttgart, 1883-1901); Schimper, *Traité de paléontologie végétale* (Paris, 1869-74); Renault, *Cours de botanique fossile* (ib., 1881-85); Gaudry, *Les enchaînements du monde animal dans les temps géologiques* (ib., 1883-90); id., *Essai de paléontologique philosophique* (ib., 1896); Huxley, "Principles and Methods of Palæontology," *Smithsonian Institution, Annual Report* (Washington, 1869); Koken, *Paläontologie und Descendenzlehre* (Jena, 1902); id., *Die Vorwelt und ihre Entwickelungsgeschichte* (Leipzig, 1893); id., *Die Leitfossilien* (Leipzig, 1896); Marr, *The Principles of Stratigraphical Geology* (Cambridge, 1898); Marsh, *History and Methods of Palæontological Research* (New Haven, 1879); Miller, *North American Geology and Palæontology for the Use of Amateurs, Students, and Scientists, with two Appendices* (Cincinnati, 1889-97); Neumayr, *Erdgeschichte* (Leipzig, 1892); id., "Klimatische Zonen während der Jura- und Kreide-Zeit," *Denkschriften der kaiserlichen Akademie der Wissenschaften* (Vienna, 1883); Ortmann, "An Examination of the Arguments by Neumayr for the Existence of Climatic Zones in Jurassic Time," *American Journal of Science*, 4 series, vol. i. (New Haven, 1896); Osborn, "The Paleontological Evidence for the Transmission of Acquired Characters," *American Naturalist*, vol. xxiii. (Boston, 1889); "The Geological and Faunal Relations of Europe and America During the Tertiary Period," *Annals of the New York Academy of Sciences*, vol. xiii. (New York, 1900); "The Law of Adaptive Radiation," *American Naturalist*, vol. xxxvi. (Boston, 1902); Packard, "A Half Century of Evolution with Special Reference to the Effect of Geological Changes on Animal Life," *Proceedings of the American Association for the Advancement of Science*, vol. xlvii. (Salem, 1898); Schuchert and Ulrich, "Paleozoic Seas and Barriers of Eastern North America," *Bulletin of the New York State Museum*, No. 52 (Albany, 1902); Scott, "Paleontology as a Morphologic Discipline," *Science*, new series, vol. iv. (New York, 1896); "Comparative Study of Paleontology and Phylogeny," *Journal of Geology*, vol. v. (1897); "The Biogenetic Law from the Standpoint of Paleontology," *Journal of Geology*, vol. viii. (1900); "Principles of Paleontologic Correlation," *Journal of Geology*, vol. viii. (1900); Suess, *Das Antlitz der Erde*, vols. i.-iii. (Leipzig, 1883-88); Suess and Margerie, *La face de la terre*, vols. i.-iii. (Paris, 1897-1902); Walther, *Einleitung in die Geologie als historische Wissenschaft* (Jena, 1893-94); "Ueber die Lebensweise fossiler Meeresthiere," *Zeitschrift der deutschen geologischen Gesellschaft*, vol. xlix. (Berlin, 1897); Weller, "A Century of Progress in Paleontology," *Journal of Geology*, vol. vii. (Chicago, 1899); "A Circum-Insular Paleozoic Fauna," *Journal of Geology*, vol. iii. (1895); "The Silurian Fauna Interpreted on the Epicontinental Basis," *Journal of Geology*, vol. vi. (1898); Williams, "The Scope of Paleontology and Its Value to Geologists," *American Geologist*, vol. x. (Minneapolis, 1892); id., *Geological Biology* (New York, 1895); Woods, *Elementary Palæontology for Geological Students*, 3d edition (Cambridge, 1902); Quenstedt, *Handbuch der Petrefaktenkunde* (Tübingen, 1885); Zittel, *Handbuch der Palæontologie* (Leipzig, 1876-92); id., "Palæontology and the Biogenetic Law," *Natural Science*, vol. vi. (London, 1895); id., *Geschichte der Geologie und Palæontologie bis Ende des 19. Jahrhunderts* (Leipzig, 1899; translated by Ogilvie Gordon, (New York, 1901); Hoernes, *Palæontologie* (Leipzig, 1899); Zittel and Eastman, *Textbook of Palæontology* (New York, 1900-02). Annual lists of the current literature are published by the United States Geological Survey and by the Geological Society of London, and in *Neues Jahrbuch für Mineralogie, Geologie und Palæontologie* (Stuttgart). Bibliographic references to the literature on the various classes of fossil organisms are inserted under their individual titles.

See the following articles: Geology; Distribution of Animals; Ecology; Evolution; Neolamarckism; Oceanography; Rock; Petrology; Biology; Botany; Zoölogy; Classification of Animals; Heredity; Paleobotany; etc.

PA'LEOTROP'ICAL, or ETHIOPIAN, REGION (from Gk. παλαιός *palaios*, ancient + Eng. *tropical*). A grand division in zoögeography composed of Africa south of the Sahara and Madagascar. The second name is the better, because only a part of the tropical regions of the Old World are included. Four subregions were delimited by Sclater and Wallace: 1. That part of Africa north of the Tropic of Capricorn as far as the Tropic of Cancer (including southern Arabia), except the Congo basin; 2. West Africa, or the equatorial Congo forest region; 3. South Africa; 4. Madagascar and the neighboring islands. This is one of the best-defined of the zoölogical regions, and [illegible]

excepted by those who would unite all the rest of the Southern Hemisphere. (See NOTOGEA.) Of its subdivisions, the most clearly defined is the Malagasy Subregion (q.v.). For the faunal characteristics of this region, see AFRICA, paragraph *Fauna*; also, DISTRIBUTION OF ANIMALS.

PALEOZO'IC (from Gk. παλαιός, *palaios*, ancient + ζῷον, ζῶον, life). The name given to the lowest of the three great divisions of the fossiliferous rocks, because they contain the most ancient forms of life. They were formerly known as the primary rocks. The systems included under this title are the Cambrian, Ordovician, Silurian, Devonian, and Carboniferous. Phillips, for the sake of uniformity, introduced Mesozoic as equivalent to Secondary, and Neozoic to Tertiary rocks. See GEOLOGY; PALEONTOLOGY; SILURIAN SYSTEM; DEVONIAN SYSTEM; CAMBRIAN SYSTEM; CARBONIFEROUS SYSTEM.

PALERMO, pä-lĕr'mō. The capital of the Province of Palermo and of Sicily, being the judicial, ecclesiastical, and military seat for the island. It is situated on the northwest coast, on the west side of the Bay of Palermo, 120 miles west of Messina (Map: Italy, H 9). The entrance to the bay affords a beautiful view. The city, which has received the appellation of 'la felice,' or 'the happy,' stretches magnificently along the shores. It is surrounded by the beautiful plain of the Conca d'Oro, and is nobly backed by mountains reaching a height of nearly 3500 feet, the shapely Monte Pellegrino rising on the north and Cape Zafferano stretching away to the east. The mean annual temperature is 63.6° F. In summer a refreshing wind blows up daily from the east, across the water.

Many of the streets are unpaved and are disagreeable from dust at certain seasons of the year; the avenues are regular, and Palermo is, on the whole, well built and clean. There are four quarters which are formed by the Corso Vittorio Emanuele and the Via Macqueda. At their intersection is the small but lively square called Quattro Canti, the geographical centre of the city. It has eight sides, and is faced by façades decorated with statues of the holy virgins of Palermo, kings of Spain, and the seasons of the year. There are in the city many relics—towers, etc.—of Norman times. All the houses are provided with balconies. The Corso, the main street, leads from the sea to the cathedral and royal palace in the southwest corner of the city—the official centre. Here the vast and picturesque cathedral faces the Piazza del Duomo (which is surrounded by sixteen huge holy statues) and stands adjacent to the important Piazza Vittoria. A statue of Santa Rosalia rises in front. The church was begun in 1169, and is a composite structure with many spoiled features. Its façade, however, is very attractive, and its tombs of the Sicilian kings, including that of Frederick II., are imposing. In the Chapel of Santa Rosalia lies the saint in a silver sarcophagus (1631), which is exhibited to the people thrice annually. Another interesting church is the San Giovanni degli Eremiti, with five domes and charming cloisters, a Norman structure belonging to the early part of the twelfth century. The superb San Salvatore is a creation of Amato, and the Carmine Maggiore is also fine. The spacious La Martorana dates from 1143. In it are the headquarters of the important Conservazione dei Monumenti di Sicilia. In the Oratorio del Santissimo Rosario is a notable altar-piece by Van Dyck.

The Palazzo Reale, or royal palace, stands on the site of a castle built in Saracenic times. The spot is associated with the lives of Manfred and Robert Guiscard. There is here, perhaps, the finest attraction in the city—the Arabic-Norman Palatina Chapel. It owes its origin to Roger II. (1132). As a palace chapel it is unsurpassed. It is beautifully ornamented with mosaics, the glass mosaics on the interior walls being especially noteworthy. Around the Piazza Vittoria stand, in addition to the royal palace, the Palazzo Sclafani, now serving as barracks; the archiepiscopal palace, dating from the fifteenth century, and possessing several graceful architectural features; and the Palazzo Municipio, containing a beautiful Greek statue of Antinoüs.

Among the fine new buildings in Palermo is the Government Finance Bureau. The modern Casino is found in the Palazzo Geraci. The beautiful Garibaldi garden lies near the small harbor of La Cala, from which, along the sea, extends the magnificent and fashionable esplanade Foro Italico as far as the Villa Giulia, or the Flora. This public park, beautified with the rarest trees, is scarcely rivaled in Italy. It has monuments to the poet Meli and to Frederick II., and a meritorious modern marble group of the Greek heroes, the Canaris, chiseled by Civiletti. Adjacent is the splendid Botanic Garden. Not far away, on the south side of the city, is the Garibaldi gate where the patriot entered in 1860. In the northwestern part of the city extends the modern Via della Libertà, the popular drive in winter. It passes through the English Garden, opposite the gate of which is a fine equestrian statue of Garibaldi, dating from 1892. In this direction lies the newest quarter of Palermo. It is occupied chiefly by foreigners. There are in the city a monument to Philip V. (1856), a statue of Charles V., the historic statue of the Genius of Palermo, and a statue of Victor Emmanuel I. In the Piazza Croce del Vespro stands a memorial (marble column and cross) erected in 1737 to the French buried here after the Sicilian Vespers.

The National Museum is in the suppressed monastery Dei Filippini, and is interesting. Among its more valuable contents is an exceptionally fine altar-piece with wings, of the early Flemish period, attributed by some to Cornelissen, by others to Mabuse. Here, also, are the famous metopes of Selinus, representing almost the highest stage of Greek art.

Palermo is the seat of a university. (See PALERMO, UNIVERSITY OF.) The communal library, rich in material on Sicilian history, has about 220,000 volumes and 3300 manuscripts. The national library has about 160,000 volumes. It together with the lyceum is established in the former New College of the Jesuits. There are in the city a Greek seminary, a conservatory of music, a royal observatory, two teachers' seminaries, the Società per la Storia Patria, a seamen's school, an agricultural institute, a Circolo Filologico, a fine modern opera house, and the new theatre called Politeama.

The manufacturing interests are small. There is now a capacious shipbuilding yard. The commerce is growing, wine, oranges, lemons, sulphur, sumach, grain, and oils being conspicuous

exports. Leading imports are coffee, sugar, coal, cotton and woolen goods, silks, and porcelain. The old harbor is the little La Cala, suitable only for small vessels. It is protected on the east by a long narrow mole reaching out toward another mole extending from the north. The new haven lies at the foot of Monte Pellegrino. The city is connected by rail with various parts of the island. Palermo is the sixth Italian port in importance and the third in Sicily, the number of ships entering and clearing in 1900 having been 6750, with a total tonnage of 3,330,000. The city is provided with electric tramways and a good water supply. At the head of the city government is a syndic. Palermo's great festival is that of Saint Rosalia, from July 11th to 15th. Regattas, races, and fireworks are its important features.

The environs, embellished with elaborate villas, are of great beauty and interest. A short distance to the southwest ancient catacombs were discovered in 1785, but were destitute of contents. Monte Pellegrino offers a very attractive ascent and a remarkable view. On its side is found the famous grotto (now converted into a church) of Saint Rosalia. The royal château at the foot of the mountain is a splendid seat, with Chinese architectural features. The population of Palermo in 1901 was 309,694. It is the fifth Italian city in size.

The town (anciently Panormus or Panhormus) was of Phœnician origin. It was Carthaginian for a long time, until taken by the Romans in B.C. 254. Augustus established a colony here. The Byzantines took it from the Goths in A.D. 535. It was a wealthy and powerful Moslem centre after 830, and became the capital of the Normans in Sicily in 1072. In 1194 it passed to the Hohenstaufen. The Court of Frederick II. here was one of the most brilliant in Europe. In 1282 occurred the massacre of the French in Palermo, known as the Sicilian Vespers (q.v.). During the residence of the Spanish viceroys the city was a regal place, and much of its distinguishing architecture and many of its features date from this epoch. It was the scene of revolutionary revolts in 1820, 1848-49, and 1860, and suffered much in consequence. Garibaldi entered the city in 1860. A national exposition was held here in 1890. Consult: Schubring, *Historische Topographie von Panormus* (Lübeck, 1870); Freeman, *Historical Essays*, 3d series (London, 1879); id., *History of Sicily* (ib., 1891); Arcoleo, *Palermo und die Kultur in Sicilien*, trans. by Nolte (Dresden, 1900).

PALERMO, University of. An institution founded by Ferdinand IV. in 1779. A higher institution of learning existed in Palermo as early as 1394. In 1805 the university was closed and was not reopened until 1850. Since then, encouraged by the Government, it has maintained a steady growth. It consists of the faculties of law, medicine, surgery, mathematics and natural science, letters and philosophy, and the schools of pharmacy and engineering. Its attendance is about 1400.

PALES, pā'lēz. In early Roman mythology, a divinity much worshiped by herdsmen. In the Roman poets, who only knew the divinity from the festival, Pales is a goddess, but Varro states that originally the divinity was masculine. The festival, the *Palilia*, or more commonly the *Parilia*, was celebrated on April 21st, which was in later times declared to be the day of the founding of Rome. It was a purification of the flocks and herds. The stables were swept, sprinkled, purified with sulphur, and adorned with wreaths. Fires of hay and straw were kindled, over which the worshipers sprang three times, and doubtless drove the herds. Prayers for the increase of the flocks were made, and also offerings of milk and cakes, but no bloody sacrifices.

PALESTINE, pāl'ĕs-tīn (Lat. *Palæstina*, from Gk. Παλαιστίνη, *Palaistinē*, from Heb. *Pĕlishti*, Philistine, from *pālash*, to wander about). A name originally applied to the coast land occupied by the Philistines, but later used in a wider sense to denote the Land of Israel. The exact limits of Palestine, taking the term in its ordinary wider significance, are somewhat hard to fix. A line drawn from the deep gorge of the Leontes (the modern Litany or Kasimiyeh), as it turns abruptly to the west to reach the sea, eastward across the valley to Mount Hermon will give a satisfactory northern boundary; similarly, a line from Mount Hermon due south to the parallel of the southern end of the Dead Sea will indicate the eastern limit; the southern boundary may be marked by a line from the south end of the Dead Sea due west to the Mediterranean. The territory thus bounded extends about 150 miles north and south, the breadth ranging from about 35 miles at the extreme north to 110 in the south. The west-Jordan portion varies in breadth from 23 to 80 miles. In other words, Palestine lies between latitudes 31° and 33° 20′ N., and extends from the sea to about longitude 35° 45′ E. of Greenwich. The west-Jordan portion comprises something over 6000 square miles, that east of the Jordan somewhat more than 3000 square miles.

Physical Features. The physical features of Palestine are very marked. The most peculiar and important of these is the remarkable depression through which flows the Jordan (q.v.). This depression is due to a geological disturbance at the end of the Pliocene period, when the whole plateau east of the Mediterranean then under water was rent in two from north to south as far as the Red Sea. In Palestine the strata just west of the fault broke and fell with a strong dip toward the deep valley thus formed. Throughout nearly the whole course of the Jordan, and to a short distance south of the Dead Sea, this valley is lower than the level of the Mediterranean. The waters of Merom (Lake Huleh) are about seven feet above sea-level, the surface of the Sea of Galilee, about 10 miles farther south, is 682 feet below the sea, while the surface of the Dead Sea, 65 miles south of the Sea of Galilee, lies 1292 feet below sea-level, with the bottom 1300 feet lower still. The surface of Palestine may be divided, roughly speaking, into four parallel zones—the seacoast plain, the hills and mountains west of the Jordan, the valley of the Jordan, and the plateau region east of the great depression.

This whole region consists of a series of limestone formations over Nubian sandstone. The upper strata are soft and porous, easily worn away by erosion, so that in many places water can be obtained only from deep wells. Where the harder strata [illegible] surface, springs abound. In the Jordan Valley

and in many parts of the east-Jordan land hot springs exist. These show that the ancient volcanic activity, evidenced not only by many earthquakes recorded in history, but especially by the great lava plateau (with many extinct volcanoes) which stretches from the Sea of Galilee to the Hauran (q.v.), is not yet entirely quiescent.

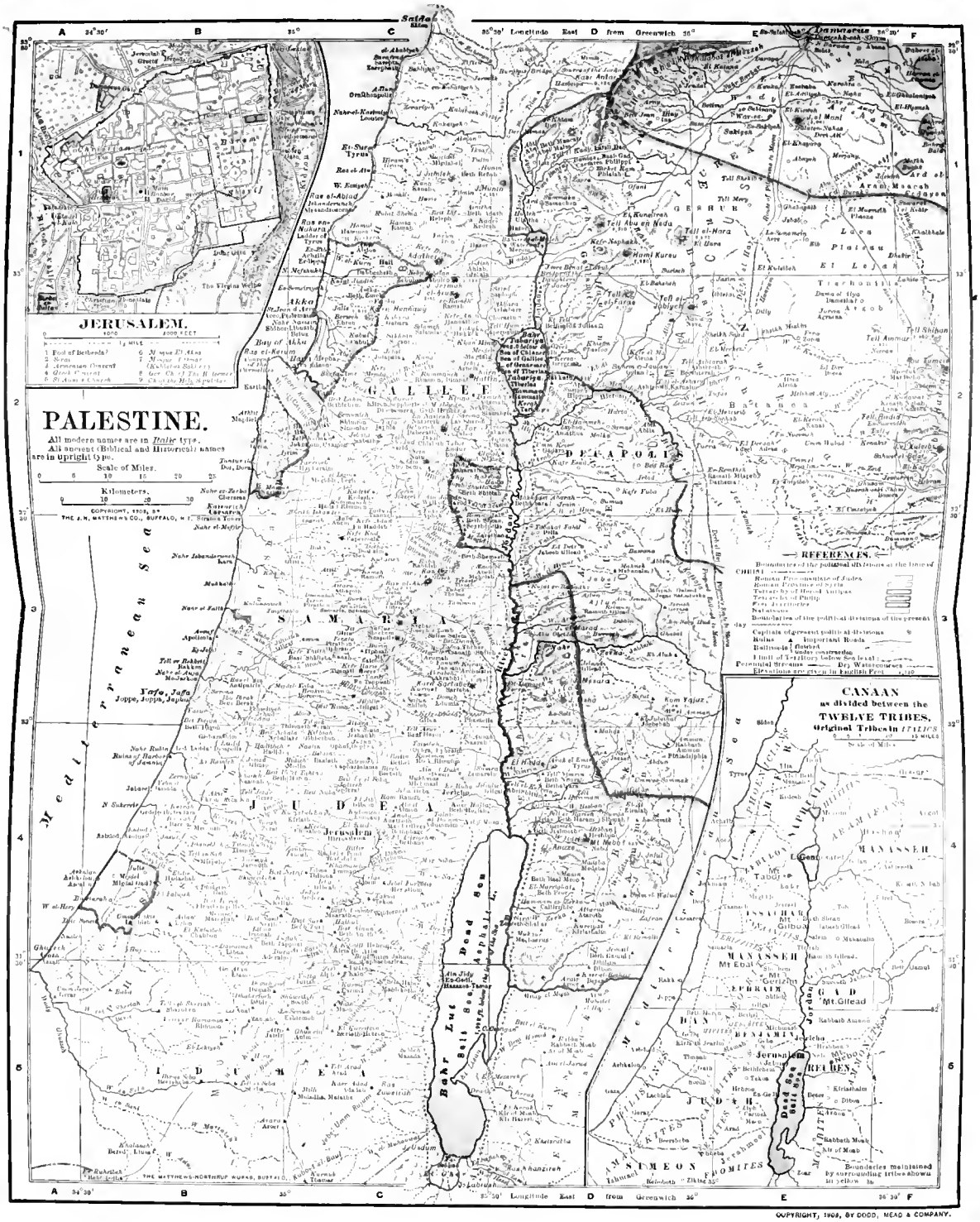
The hilly range west of the Jordan, in striking contrast to the eastern plateau, is broken and irregular in character. It may be divided into several distinct regions. Beginning at the extreme south, we have the 'Negeb' or 'south' region (literally the dry or parched land), a desert tableland, 1500-2000 feet above sea level, intersected by wadies or ravines running east toward the Dead Sea or northwest toward the Mediterranean. The largest of these is the Wady es-Seba, which passes by ancient Beer-sheba and enters the Mediterranean as Wady Ghuzzeh a few miles south of ancient Gaza.

The northern part of the Negeb is higher (about 2500 feet above sea level) and more broken. The central ridge now becomes more pronounced, and the highland or mountain region of Judah begins. This extends as a fairly unbroken plateau some miles north of Jerusalem. The highest portion of the Judean range is near Hebron (3370 feet). Toward Jerusalem the level sinks in places to about 2400 feet, but becomes higher as it extends north. The crest of the Judean highland averages nearly 15 miles in breadth. From it the descent to the Dead Sea, 10 or 15 miles away, is rapid, breaking down finally in precipitous cliffs. The whole region bordering on the Dead Sea is wild, barren, and rocky, intersected by countless deep ravines leading toward the sea. It was known as *Jeshimon* (the desert waste), and its upper reaches nearer the central plateau formed the Wilderness of Judah with its various subdivisions, the Wilderness of Tekoa, of Jeruel, of Maon, etc. West of the Judean highland the country sinks gradually toward the coast plain. This region of hills and valleys was known as the *Shephelah*, i.e. the low land. In the more open valleys and on the hillsides both the Shephelah and the central plateau are capable of high cultivation. In other parts, especially the uplands, they are more suited for pasturage. From the coast plain several large valleys lead up into the interior highlands, of which those of Ajalon, of Sorek, and of Elah have become famous as scenes of great conflicts between invaders and defenders of the uplands.

The central highland continues north of Jerusalem for upward of forty miles, but with less uniformity. North of Bethel (10 miles north of Jerusalem) it begins to be broken. The general level sinks, though many peaks are over or nearly 3000 feet high. The descent to the Jordan Valley is in places very abrupt, though also traversed by a number of passable valleys. One of these, the Wady Farah, pierces far into the interior. Near Shechem, situated in a beautiful vale between Mount Gerizim (2849 feet) on the south and Mount Ebal (3077 feet) on the north, a network of valleys seems to converge. One of these, the Wady esh-Shair, opens out northwest into the plain in which the city of Samaria was situated and continues on to the coast. Another opens into the Wady Farah, and thus gives open connection with the Jordan Valley. Near Shechem, then, the central highland may be said to break down into a system of valleys, plains, and isolated peaks. Between Bethel and Shechem, especially along its western border, the whole plateau is more open and undulating, more fertile and capable of cultivation, than that of Judah to the south. This region was known as Mount Ephraim, rather a succession of hills than one continuous mountain. The part of the coast plain west of Mount Ephraim is the famous 'Plain of Sharon.'

From the hills near Samaria northward the country takes on a new character. The low-lying plain of Dothan, 10 miles north of Samaria, connects the seacoast plain with the southern reaches of the great Plain of Esdraelon (q.v.), a triangular-shaped expanse, about 16 miles across, midway between the Jordan and the sea, with an average elevation of but about 250 feet. This remarkable district is separated from the seacoast plain to the west by a series of low hills running northwest from the plain of Dothan and culminating in the Carmel range (1500-1800 feet), which juts out into the Mediterranean in a promontory 556 feet high, at the foot of which there is a narrow strip of beach. The Plain of Esdraelon is shut in on the east by the Gilboa Mountains (1300-1650 feet) and the hills near the site of ancient Shunem and Nain. Between these two ranges of hills the deep valley of Jezreel, all of it below the sea level, leads down to the Jordan. The northeastern corner of the plain opens out into another rapidly descending valley across which Mount Tabor (1843 feet) rises in lonely grandeur.

North of Esdraelon, in Lower Galilee, the mountains begin to reappear. The whole region between the Sea of Galilee and the Mediterranean (i.e. the Galilee of the New Testament) is quite open. None of the peaks attains a height of 2000 feet, and they are for the most part isolated and interspersed with valleys and plains. There are two main systems of hills in this lower Galilee. One bounds the Plain of Esdraelon on the north, extending from the river Kishon just opposite Mount Carmel to the Sea of Galilee. The hills about Nazareth and Cana and Mount Tabor belong to this system. North of these hills, extending from the northwest coast of the Sea of Galilee to the coast plain, is a long, low plain broken into several portions by low hills, crossing it from north to south. The most famous part of this plain is the fertile Sahel el-Buttauf (Assochis), ten miles long and two to three miles wide. The eastern end of the plain as it descends to the Sea of Galilee forms the Land of Gennesaret. A second line of hills, north of the long plain, at the northern foot of which runs the bed of the Wady Shaib, completes the hill system of Lower Galilee. North of the Wady Shaib the elevation rapidly increases. As in Judah, we now find a high central plateau with an elevation of 2000-3000 feet, with occasional peaks still higher. The descent on the east, to the Jordan, is steep; that on the west, to the sea, more gradual. The plateau is narrower at the north than in its southern portion. Northern Galilee is limited by the Leontes, which, rising between the Lebanons, makes a sharp detour to the west and enters the sea just north of Tyre. East of the angle formed by the Leontes the mountains of Galilee extend north-



ward to form a portion of the great Anti-Lebanon range.

Across the valley through which flow the upper courses of the Jordan lie the rapidly ascending slopes of Mount Hermon, whose summit is 9166 feet above the sea. Out from the depths of this vast mountain flow most of the springs which combine to form the Jordan. Where these streams converge the valley is 8 to 10 miles wide and but little above the level of the sea. It soon becomes marshy, and at last opens into Lake Huleh. After this the valley narrows and the stream descends rapidly to the Sea of Galilee. From this lake to the Dead Sea, 65 miles, the Jordan Valley varies in width from 3 to 14 miles. It is only about 4 miles wide where it leaves the Sea of Galilee, but broadens where it is joined by the Valley of Jezreel, 13 miles below. It again narrows, but after receiving the Jabbok continually widens until, at Jericho, it attains its maximum breadth. Where the Jordan enters the Dead Sea the valley bottom is swampy. On either side of the valley the ascent to the highlands is generally steep. The western side is much broken by many ravines and passes, but the eastern hills present a more uniform appearance, being broken only at long intervals by the larger streams. The valley is of inexhaustible fertility, and has an almost tropical climate. The Dead Sea marks the deepest part of this great depression. It has no outlet, and the constant evaporation, aided by the saline character of many of the springs in the neighborhood, makes its waters so heavily charged with salt that they are exceedingly bitter in taste and of high specific gravity. They are, nevertheless, very transparent. In some places the shores are heavily lined with salt deposit. The Dead Sea is also remarkable for the petroleum springs below its surface from which come the lumps of bitumen often found floating on its waters. Hence its ancient name, *Asphaltis*. The sea is deepest (c.1300 feet) at its northern end. The southern half is quite shallow. Lying at a level of 1292 feet below the sea, and surrounded by hills rising 3000 to 4000 feet above its surface, the Dea Sea is one of the hottest regions on the earth.

Across the deep, hot valley lies Eastern Palestine, much more uniform in character than the territory west of the Jordan. It divides naturally into three main sections. From Mount Hermon to the Yarmuk (Hieromax), a large perennial stream traversing the eastern plateau and emptying into the Jordan, the limestone is overlain with a thick volcanic formation. Extinct volcanoes abound and the lava soil renders the region extraordinarily fertile. Only the western portion, the Jaulan (ancient Gaulanitis), belongs within the limits of Palestine. The eastern portion represents the ancient Bashan. The general elevation is highest near Hermon, gradually sinking toward the Yarmuk. The drainage is all west (to the Jordan) or south (to the Yarmuk). Only near the Sea of Galilee and the Yarmuk is the plateau much broken by ravines.

South of the Yarmuk to the Jabbok and from the Jabbok to the Arnon, a total distance of nearly 100 miles, lie ancient Gilead and the Plains of Moab, identical with the Perœa of New Testament times. The lava soil characteristic of the region north of the Yarmuk is not found here. Basalt gives place to limestone, and the soil, though fairly well watered, is of inferior fertility. It is consequently less fitted for agriculture, but has ever been famous for its pasturage. It is a high rolling plateau broken only by the larger wadies running to the Jordan. North Gilead (modern Ajlun, north of the Jabbok) is not so high as South Gilead and the Plains of Moab (the modern el-Belka), but more heavily wooded and better supplied with water. The most southern portion, south of the Arnon, and the home of ancient Moab, is even more barren and dry, yet still suitable for pasturage.

Palestine is somewhat deficient in its water supply. During the winter there are heavy rains, but the numberless wadies, with few exceptions, are dry in the summer or dry season. Where the hard limestone is near the surface, at the foot of high hills, perennial springs are numerous. This is mainly true of Northern and Central Palestine, while in Judah and on the plateau of Southern Gilead and Moab springs are rare. The Jordan is the only considerable stream. Its sources are perennial springs mostly flowing from the slopes of Mount Hermon. Of these the most famous is that near Banias, the ancient Paneas, near the site of Dan, where the stream issues forth from a large cave. The Jordan is supplied farther down by several perennial affluents, of which the Yarmuk, the Wady el-Arab, and the Jabbok on the east, and the Nahr Jaluad (in the Valley of Jezreel) and the Wady Farah on the west are the most important. On the western slope the Leontes at the extreme north, the Kishon (which drains the great Plain of Esdraelon), and the Zerka or Crocodile River are perennial.

In the whole country there are but two seasons in the year. The rainy, or 'winter' season, begins in October-November with the 'early rain.' This softens the parched and baked soil and enables the farmers to plow. The rain, with occasional snows on the mountains, falls more or less continuously until February. During February sowing takes place. Some weeks later (March-April) the so-called 'latter' rain is indispensable to the well-being of the now growing crops. By May the rains are over, and the long hot summer (May to October) begins. The average annual rainfall is 21 inches. The different elevation of the several zones of Palestine causes a great variety in the temperature and other conditions. When it is pleasantly cool on the uplands it is unendurably hot in the Jordan Valley a few miles away. The highlands are dry and salubrious, the lowlands moist and oppressive. The mean annual temperature of the uplands is 63°, with an average maximum of 100° and an average minimum of 34°. The prevailing winds are from the sea, northwest in summer, west or southwest in winter. The hot winds (sirocco) carrying clouds of dust from the deserts east and south often inflict damage and severe discomfort.

Flora and Fauna. Considering the limited area and the fact that portions of the country are desert-lands, the flora of Palestine is remarkably rich. This is owing to the fact that Palestine is the meeting point of three large floral regions which differ considerably from each other, the Mediterranean, the Asiatic steppe-flora, and the tropical flora of Arabia and Egypt. The latter is confined to the valleys, in which the papyrus grows near the water; dates, ba-

palms, figs, olives, almonds, as well as myrtles, acacias, azaleas, and many other Mediterranean and tropical plants, are also abundant. On the Lebanon slopes north of Judea there are some heavy forests. On the lower slopes they are deciduous, chiefly of oak and beech, with maples, poplars, plane trees, and mulberries. Higher up there are pine forests associated with spruce, cypress, juniper, and cedars, including some remaining specimens of the cedar of Lebanon. The fauna is also varied, including over 100 species of mammals and several hundred birds. The larger wild animals, however, such as the lion, bear, and leopard, have quite disappeared. The most characteristic surviving mammals are mountain goats and the hyrax (q.v.).

Present Economic Condition. The economic development of the country is hindered by the lack of a settled agricultural population, the present inhabitants being chiefly Syrians and Arabs. The soil is fertile chiefly in the sense that it can be rendered highly productive by irrigation and careful cultivation, but it has largely lain barren and uncultivated for many centuries. The herding of sheep and goats was, and still is, one of the chief means of support of the inhabitants. Within the last fifty years, however, considerable areas of waste land have been brought under cultivation through the efforts of Western agricultural colonists. Attempts to found agricultural settlements were made by Germans and Americans as early as 1850, but the first successful colonies were those founded by Germans at Jaffa and Haifa in 1868, and later at Jerusalem. Since then several other colonies have been founded by Jewish immigrants impelled by the Zionist movement. (See Zionist Movement.) Though they have not all been successful, the net result has been a distinct improvement in the economic conditions of the country. Modern agricultural methods have been introduced and serve as an example to the native farmers, and new industries have sprung up. Roads have been greatly improved, and wagons have begun to replace camels and mules. A railroad has been built from Jaffa to Jerusalem, and another is under construction between Haifa and Damascus.

Political Geography and History. The early history of Palestine, to the sixteenth century B.C., is exceedingly obscure. From the records of the Egyptians we learn that it was a part of the land of the *Amu* (Southwestern Asia), earlier called by the same people *Lotan* or *Ruten*. The term *Kharu* was a designation for Southern Palestine, *Amor* or *Amur* for the northern district and the Lebanon region. The earliest Babylonian records appear to have included the country under the term *Martu*, or the west land, which later gave way to *Amur*, or the land of the Amorites. While Egyptian forces may have made occasional incursions into Palestine earlier than the sixteenth century B.C., the dominant power in Southwestern Asia at this early period was Babylonian. This supremacy gave way to the so-called Amoritic, i.e. the incoming of great numbers of Semites (q.v.) from the Arabian deserts. These either absorbed or exterminated the older population, and, being of the same general Semitic stock as the Babylonians, readily learned and adopted their culture, so that the civilization of Babylonia continued dominant. Egyptian inscriptions show that this people prospered in Palestine and engaged in commerce with Egypt. Egyptian overlordship over Palestine was fully established by Thothmes III. (c. 1515-1485 B.C.), who defeated a great confederacy in which Northern Palestine was involved, near Megiddo, in the Plain of Esdraelon. His famous list of 119 subjugated towns includes names of many places in Palestine. He organized the conquered territory, established a number of fortresses, filled them with Egyptian garrisons, and appointed governors to look after his interests. The Tell el-Amarna letters (see Amarna Letters) show that the common name of the land was Canaan (see Canaan; Canaanites), and that the language of the people was simply an earlier form or dialect of that known later as Hebrew, spoken not only by Israel, but by the Phœnicians, the Moabites, and the Edomites. They show further that under the weak rule of Amenophis IV. Palestine was rapidly passing away from Egyptian control. The Hittites (q.v.) from the north, and the 'Khabiri' (thought by some to be the Hebrews, and, at any rate, a part of the great Aramean movement to which the Israelites belonged) in the central and southern regions, were seeking to gain possession. The Egyptian governors were plotting one against the other, all meanwhile writing to Egypt for aid and loudly protesting their individual loyalty to their sovereign. This era of confusion was ended by the revival of Egyptian supremacy under the new (nineteenth) dynasty (c.1350 B.C.), whose kings, Seti I. and Rameses II., rolled back the Hittite advance and again reduced Palestine to complete submission to Egypt. The next Egyptian dynasty was weak and Palestine broke up into a number of petty kingdoms.

About this time (B.C. 1300-1100) two distinct peoples, of different origin and character, sought to make this country their home, viz. the Philistines (q.v.) and the Hebrews. The former became the dominant people of the whole seacoast plain. The latter, after varied experiences, began a series of conquests which resulted finally in giving them control of Palestine.

The Canaanites appear to have been so disorganized that they offered little united opposition. Only one concerted action on their part is recorded, the confederacy of five kings in the region west of Jerusalem (Josh. x.). The work of conquest was long and gradual. At first the Israelites held but little more than the hills. The seacoast plain and the Plain of Esdraelon, defended by heavy armed troops with chariots, they avoided. Israel did not exterminate the Canaanites, except where the resistance was most stubborn. In general they simply reduced them to subjection, and in many cases probably the two peoples lived side by side on terms of equality. The old language of Canaan was used by the Israelites, and with the adoption of the language went the adoption of many Canaanitish ideas and customs, also the knowledge of the Babylonian culture then prevalent in the country.

The tribes as finally settled in the conquered land were distributed as follows, according to the biblical narrative: East of the Jordan between the Arnon and the Jabbok the Reubenites and the Gadites had their homes. The Reubenites, who occupied the northern half of the original Moabite domain, appear to have soon lost their identity, either because they were gradually absorbed by the Gadites, who finally occupied this territory,

or because they gradually drifted eastward and became absorbed among the Ammonites and other tribes nearer the desert. The western highland from Jerusalem south to the 'Negeb' was the home of Judah. Southwest of Judah lay the territory of Simeon. Between Judah and the Plain of Esdraelon the country was occupied mainly by the House of Joseph, i.e. the tribes of Benjamin (northeast of Judah), Ephraim (the central portion), and Manasseh (the northern part). A small district between Judah and Ephraim on the northwest was allotted to the tribe of Dan, but this was so small that soon after the conquest a large section of this tribe (600 families) migrated to more roomy quarters in the extreme north near the sources of the Jordan. In the valley of Jezreel and the fertile Plain of Esdraelon lay the territory of the tribes of Issachar (the eastern portion) and Zebulon (the western part). Part of Southern and all of Northern Galilee was occupied by Naphtali (on the east) and Asher (on the west behind the Phœnician territory of Sidon and Tyre). After the conquest of the west-Jordan territory men of Manasseh (and possibly of Ephraim also) passed over the Jordan and conquered North Gilead, between the Jabbok and the Yarmuk, and probably part of Golan and Bashan, north of the Yarmuk. The coast north of Carmel remained in possession of the Phœnicians. South of Carmel the Philistines controlled it. Israel was never a seafaring people.

About B.C. 1050 the divided Hebrew tribes were united into a kingdom under Saul, of the tribe of Benjamin. His successor, David, completed the work of firmly establishing Israelite supremacy in Palestine. Under David and Solomon, for the first and only time in its history, Palestine was the home of a united people all under one central government. About B.C. 937 this unity was disturbed by the formation of two kingdoms, a northern (Israel) and a southern (Judah). One result of this division, coupled with the growing power of the Aramean kingdom of Damascus, was that Israelitic control of the east-Jordan territory became weakened, without, however, resulting in any essential changes in the population. The northern kingdom fell before the power of Assyria in B.C. 722. The annals of Sargon, the Assyrian King, state that he deported 27,290 people, and, according to Assyrian custom, transported thither a number of Arameans from Babylonia. Seventy-five years later Assurbanipal (B.C. 647) added another contingent, made up of various Eastern nationalities. These united with the remnant of the old Israelitic stock, and thus a mixed population, but still essentially Semitic, came to occupy the old Ephraim-Manasseh territory. Galilee seems to have gradually filled with a mongrel Phœnician-Syrian population, which was not seriously disturbed till near B.C. 100, save by the Iturean occupation. (See ITUREA.) The southern kingdom came to an end when Nebuchadnezzar of Babylon captured Jerusalem in B.C. 586. The best elements of Judah were carried to Babylon and the whole country left desolate. For the next half century Palestine seems to have been left largely to itself. The most important movement during this period was the influx of Nabatean Arabs, who pressed in from the deserts east and southeast, occupied much of the old Ammonite and Moabite territory, and, forcing the Edomites out of their abode, pushed them northward into Southern Judah, which now became 'Idumean' territory. The colony of exiles who returned from Babylonia by permission of Cyrus in B.C. 536 occupied only the northern part of the old kingdom of Judah. For further details of the history of Palestine during this period, see JEWS.

After the reorganization of the Persian Empire by Darius I., Palestine was a part of the Province or Satrapy of Syria (i.e. of the regions west of the Euphrates). The details of its administration are somewhat uncertain. The satrapy was subdivided into a number of districts, of which Judah, Samaria, and Phœnicia certainly were administered by separate Governors. What the exact arrangement was of the coast region, Galilee, the East Jordan territory, and Idumea is obscure. Through the labors of Ezra and Nehemiah (qq.v.) the Judean community was thoroughly consolidated, Jerusalem fortified, and foreigners expelled. The Jews constantly encroached on Samaritan territory and gradually enlarged their border toward the northwest. The Samaritans also became more closely united through the founding of the Samaritan religion, based on the Pentateuch alone, by a priest who was expelled from Jerusalem by Nehemiah, and, at a date now not known, by the building of a temple on Mount Gerizim. (See SAMARITANS.) During the Persian period the language of the Jewish community assimilated itself to the Aramaic spoken throughout the region and the old Hebrew gradually ceased to be the tongue of the common people.

The chief result for Palestine of Alexander's conquest of the East was the introduction of a large Greek element. Samaria was destroyed and rebuilt as a 'Macedonian' city. It is possible that Pella and Dium, east of the Jordan, were built by Alexander's veterans. Other Greek cities followed, especially in the east-Jordan land (see DECAPOLIS), while many of the old sites became practically Greek cities. Alexander followed the Persian example and attached Palestine to Syria for administrative purposes. In the struggles of his successors it came into the hands of Ptolemy I. of Egypt, and until B.C. 197 was under Egyptian control. Then it passed to Antiochus III. (the Great) of Syria. In B.C. 168 the attempt of Antiochus IV. to destroy the Jewish religion led to the great War of Independence. (See MACCABEES; JEWS.) When the struggle was over, Judea, now under the Asmonean priest-princes, was in control of all Southern Palestine from the Jordan to the coast. The rest of the land was nominally under Syria, but was practically in a condition of anarchy. East of the Jordan the Nabatean Arabs were in possession of all but the territory of the Greek cities. Under the Asmoneans, Hyrcanus I., Aristobulus I., and Alexander Jannæus (B.C. 135-78), the Jews succeeded in subjugating, first Idumea and Samaria, then Galilee, and finally nearly all of the old east-Jordan territory. The Idumeans and Galileans were compelled to adopt Judaism, while the Samaritans saw their temple (c.127 B.C.) and capital (c.108 B.C.) destroyed. The Greek cities east of the Jordan also suffered greatly. The Jewish population of Galilee, so familiar to the readers of the New Testament, dates only from B.C. 105-104.

The quarrels of the rival factions paved the way for Roman intervention. Pompey arrived in

Syria and captured Jerusalem in B.C. 63. He deprived the Jews of the greater part of their territory except Judea proper and transferred the remainder to the government of the new Roman province of Syria, of which it remained a part from B.C. 63 to A.D. 67. During most of this time Judea and other districts were under the control of Herod the Great and his successors. (See HEROD.) The greater part of the country was included in the four districts, Judea, Samaria, Galilee, and Perea, east of the Jordan, south of the Jabbok. The territory north of the Jabbok was broken up into minor divisions, Gaulanitis, Auranitis, Trachonitis, Batanæa, etc., under petty tetrarchs or governors. At the breaking out of the Jewish War (A.D. 66-67) Palestine was made a separate province under charge of Vespasian. The great struggle against Rome was closed by the capture and ruin of Jerusalem in A.D. 70 and the destruction of the Jewish State. New cities now sprang up under Roman protection, and apart from Jerusalem the country was prosperous. In 132-135 occurred the rising of the Jews under Bar-Cochba. This rebellion was crushed out with fearful bloodshed and devastation, and the Emperor Hadrian in rebuilding Jerusalem changed its name to Ælia Capitolina, and absolutely forbade any Jew to dwell in it. Never since has Jerusalem been a Jewish city, or Palestine a Jewish land. Greeks, Romans, Arabians, and large elements of the fundamental Aramæan (Syrian) stock with the remnant of the Jews made up its population then, and of these the Arabian and Syrian are dominant to-day.

Palestine remained an integral part of the Roman Empire, and afterwards of the Byzantine Empire until the invasion of the Persian King Khosru II. in 614. Up to the era of Constantine the condition was especially flourishing. Remains of buildings and cities in now absolutely deserted places are a wonderful testimony to the great prosperity. After Constantine and the division of the Empire Greek Christianity became dominant and Palestine became a Christian land. It was now the habit to speak of it as divided into *Palæstina Prima* (Judea and Samaria), *Secunda* (Galilee), and *Tertia* or *Salutaris* (Idumea and Moab). Each of these districts was divided ecclesiastically into various bishoprics. See also the article JEWS for Palestine during the Roman period.

The Persian control was transient, but that of Mohammedanism, beginning in 635, proved to be permanent. Since then, apart from the era of the Crusades, the history of Palestine contains little of general importance. Partly under the influence of Islam, but much more from other general causes, the culture of the Græco-Roman period passed away, the beautiful cities, temples, and churches fell into decay and ruin, and no new developments took their place. The era of degeneration had set in. The Latin Kingdom of Jerusalem (see JERUSALEM) founded by the Crusaders in 1099, and overthrown by Saladin in 1187, was only an episode of no permanent value, though the Crusaders left their imprint in churches, monasteries, etc., all over the land.

After the conquest by the Ottoman Turks in 1516 the condition of Palestine became only worse. In the nineteenth century, however, mainly as a result of the labors of the missionary societies, the beginning of new activity and a better era began to manifest themselves. The large influx of Jews from Europe under the Zionist movement, and above all the opening of the country to railway enterprise, promise a better future.

Modern Palestine is broken up into a number of administrative districts. The Mutesarrif of the Sanjak (province) of Jerusalem governs the southern part west of Jordan. The remainder of Western Palestine with the Belka is a part of the Vilayet of Beirut. East of the Jordan, all north of the Jabbok belongs to the Sanjak of Hauran. The population of the Sanjak of Jerusalem is about 320,000; that of the remainder of the country is variously estimated, but exact figures cannot be obtained. The total is probably near 650,000. It has increased more rapidly in later years. Under a good government and with more thorough cultivation, several times this number could be easily supported.

BIBLIOGRAPHY. The literature on Palestine is enormous and will be found fully registered down to 1878 in Rohricht's *Bibliotheca Geographica Palestinæ* (Berlin, 1890). Outside of the Bible and Josephus the older works of importance are few. The *Onomasticon* of Eusebius (Latin trans. by Jerome) and the various accounts of pilgrimages from Jerome to the Crusaders are valuable as contemporary witnesses, but not reliable for identification of ancient sites or for ancient history. The great works of Reland, *Palæstina* (Utrecht, 1714), and Ritter, *Erdkunde*, vols. xiv.-xvii. (Berlin, 1848-54), are still of great value, especially for the notices by early writers. The results of modern exploration are given in Robinson, *Biblical Researches* (Boston, 1841 and 1856); id., *Physical Geography* (Boston, 1865); the various works of Titus Tobler, from 1849 to 1868; Guérin, *Description de la Palestine* (7 vols., Paris, 1868-89); the *Quarterly Statements* of the Palestine Exploration Fund (London, 1869 et seq.); the seven quarto volumes of the *Survey of Palestine*, published by the Fund; and in the publications of the German *Palästina-Verein* (Leipzig, 1878 et seq.). To these, as of special value, may be added: *The Library of the Palestine Pilgrims' Text Society* (13 vols., Palestine Exploration Fund); Schumacher, *The Jaulan*, *Across the Jordan*, and *Ajlun* (London, 1888, 1889, and 1890); Hull, *The Survey of Western Palestine* (ib., 1886); Le Strange, *Palestine Under the Moslems* (ib., 1890); Tristram, *The Fauna and Flora of Palestine* (ib., 1884); and other works published by the Palestine Exploration Fund. Comprehensive general treatises on Palestine are the guide books of Baedeker and Murray; G. A. Smith, *The Historical Geography of the Holy Land* (London, 1897); and Buhl, *Geographie Palästina* (Leipzig, 1896), most excellent. For the most ancient period, consult Paton, *Early History of Syria and Palestine* (New York, 1901), where a full bibliography will be found. The standard histories of Israel and the archæologies of Benzinger and Nowack (both 1894) are valuable for the Old Testament period. For the era from B.C. 175 to A.D. 135, Schürer, *History of the Jewish People in the Time of Jesus Christ* (Eng. trans., Edinburgh, 1886-90), is the most reliable work. An excellent map is that of Smith and Bartholomew (Edinburgh, 1902); the maps of Kiepert and of the Palestine Exploration Fund are also to be recommended.

PALESTINE. A city and the county-seat of Anderson County, Texas, 100 miles southeast of Dallas; on the International and Great Northern Railroad (Map: Texas, G 4). It has two libraries, Young Men's Christian Association, fine city hall, and opera house buildings, and the general offices and shops of the International and Great Northern Railroad. Old 'Fort Houston' is of interest. The products of the most extensive industries, in which there is a considerable trade, include cotton, cottonseed oil, beef, iron, fruit, and vegetables. There are in the vicinity large iron ore deposits, also a salt mine of importance. Settled in 1846, Palestine was incorporated under a general law in 1870. The government, under this statute, is vested in a mayor, biennially elected; in a council composed of the mayor and aldermen elected on a general ticket; and in administrative officials, the majority chosen by popular vote. Population, in 1890, 5838; in 1900, 8297.

PALESTINE EXPLORATION FUND, THE. A society founded in London, June 22, 1865, for the accurate and systematic investigation of the archæology, topography, geology and physical geography, natural history, manners, and customs of the Holy Land for biblical illustration. Under its auspices the following expeditions, travels, and excavations have been made: December, 1865-May, 1866, under Captain Wilson, to fix spots for investigation and to collect information; May, 1867-April, 1870, under Lieutenant Warren, to settle questions connected with the Holy Sites; 1870, under Professor Palmer and C. F. Tyrwhitt Drake, to examine the desert of the Tih; 1872-77, under Captain Stewart Drake, Lieutenant Conder, and Lieutenant Kitchener, to survey Western Palestine; 1873-74, under Clermont-Ganneau, for archæological research; 1881, under Lieutenant Conder, for the partial survey of Eastern Palestine; 1883-84, under Prof. E. Hull and Lieutenant Kitchener, for the geological survey of the Dead Sea region and the Wady Arabah; 1890-93, under Flinders Petrie and Frederick J. Bliss, for the excavation of the buried cities in the mound Tell el-Hesy; 1894-97, under Bliss and Dickie, for excavations at the south and the southwestern portion of Jerusalem; 1898-1900, under Bliss, for excavations at Tell es-Safi (Gath?), Tell Zakariyah, Tell Sandahannah, and Tell el-Judaidah; 1902, under R. A. Stewart Macalister, for the excavation of Gezer. Since 1869 the society has issued a *Quarterly Statement*. The more important publications of the society are: *Survey of Western Palestine: Memoirs* (7 vols., 1881-84); *Survey of Eastern Palestine*, by Conder (1900); *Excavations at Jerusalem*, by Bliss and Dickie (1894-97); *The Fauna and Flora of Palestine*, by Tristram (1884); *The Geology of Palestine and Arabia Petræa*, by E. Hull (1886); *Archæological Researches*, by Clermont-Ganneau (1896, et seq.); the great map of Western Palestine; the raised map; the map of Modern Palestine (in 20 sheets). The society has also a Palestinian Museum at its office, 38 Conduit Street, London. Consult: *Thirty Years' Work in the Holy Land* (London, 1895), an official *résumé* of the work of the Fund prepared by Walter Besant; Conder, "Palestine," in *The World's Great Explorers and Explorations* (ib., 1899).

PALESTINE PILGRIMS' TEXT SOCIETY, THE. A society established in London, England (about 1885), for the purpose of publishing translations of the early descriptions of Palestine and the holy places, written by pilgrims and travelers between the fourth and fifteenth centuries. These accounts were intended to explain many of the topographical references which abound in ancient and mediæval literature from the earliest times to the periods of the Crusades and later, and to illustrate the manners and customs prevalent in the East in bygone times. The narratives are written in Greek, Latin, Arabic, Hebrew, Old French, Russian and German, and include curious records of pilgrimages, which begin with the *Unknown Pilgrim of Bordeaux*, and follow in unbroken line down to comparatively recent date, including such interesting historical monuments as Saint Jerome's *Pilgrimage of the Holy Paula* (A.D. 382), Mukadda's Description of Syria (785), *Jacques de Vitry* (1180), and Bohaedden's *Life of Saladin* (1145-1232). After a period of eleven years' work, the Society carried out the programme originally outlined and the results of its labors are found in a library of twelve volumes, which in 1896 were handed over to the Palestine Exploration Fund to be by that society distributed to the members of the Palestine Pilgrims' Text Society.

PALES'TRA (Gk. παλαίστρα, *palaistra*, from πάλη, *palē*, wrestling). Properly, a wrestling-school; hence one of the schools in which the Greek boys were trained in gymnastic exercises. They were usually private institutions, though in later times some were supported by the State. The name is also applied to that part of the Greek gymnasium which was set apart for wrestling, and sometimes even becomes a synonym for gymnasium.

PALESTRINA, pä'lēs-trē'nä. A town of Central Italy, the ancient Præneste (q.v.).

PALESTRINA. GIOVANNI PIERLUIGI DA (c.1524-94). A great Italian composer. He was born in a small town southeast of Rome called Palestrina. His real name and the condition of his parents in life are as uncertain as is the correct year of his birth. The date of his birth is variously stated from 1514 to 1524, with the weight of evidence strongly in favor of the latter date. His first experience in music is said to have been in the Church of Santa Maria Maggiore, whose choirmaster gave him his first lessons in music. He is supposed to have studied four years in Rome at the celebrated Gallo Belgian school established by the Frenchman Goudimel (q.v.). This would seem to comprise all the instruction he ever received. At the age of twenty he was appointed to a canonry in the cathedral of his native town, his duties being to play the organ, sing, and teach the boys. The pay was very poor, and the duties seem to have been very distasteful. During his stay here he married a peasant girl named Lucrezia de Goris, who owned a small vineyard. The chief ecclesiastical functionary of the town was Giovanni del Monte, who afterwards became Pope, with the title of Julius III., and who, as sovereign pontiff, maintained his interest in the young composer of Palestrina. Jacob Arcadelt, the great Flemish musician, resigned his post in the Cappella Giulia, and, although he was legally ineligible for the post, by reason of his marriage, Palestrina was named for the appointment by his patron, Pope Julius III. This was the most

important period of his life, in that it was the period of his greatest development as a musician. On the accession of Pope Paul IV., in 1555, Palestrina was dismissed, with a pension of six gold *scudi* (about six dollars) a month. He was so well known, however, that he secured almost immediate employment at the Church of Saint John Lateran, where he stayed for six years, until his appointment as director of the Church of Santa Maria Maggiore, where he remained for many years. This was the most prolific period of his life, and many of his finest madrigals, including the *Donna bella e gentil*, date from this time. The crucial test of his life, however, was yet to come. Pope Pius IV., after the close of the famous Council of Trent, appointed, in 1564, a committee of cardinals to investigate and, if possible, reform the condition of Church music. (See SACRED MUSIC.) Palestrina was asked to support the argument of those who in the Council of Trent had fought against a too rigid application of the Pope's radical views, by submitting a mass which should be free from all the errors prevalent at this time and yet be polyphonic in character. In response he wrote the great *Missa Papæ Marcelli*, which was so successful that it won the day, and secured for its composer the appointment of composer to the Pontifical chapel. On the death of Animuccia he was appointed Master of Music at the Cappella Giulia, an office which he held up to the time of his death. His music is grave, beautiful, and unemotional in character, but reverential in the highest and purest sense of the term. As a composer he is one of the important landmarks in the entire history of music, and in the realm of sacred composition he remains supreme. He was a prolific composer, his compositions alone filling 33 volumes, a complete edition of which was published between 1862 and 1894 by Breitkopf & Härtel, Leipzig, Germany. Particularly exquisite are the following masses: *Æterna Christi Munera; Dies Sanctificatus; O Sacrum Convivium; Assumpta est Maria in Cælum; Dilexi Quoniam; Ecce Ego Joannes.*

PALESTRO, pä-lĕs'trō. A village in the Province of Pavia, Italy, on the Sesia, 34 miles west by south of Milan (Map: Italy, C 2). It is famous as the scene of a battle between the allied Sardinians and French and the Austrians in May, 1859, in which the latter were defeated with great loss. Population (commune), in 1901, 3498.

PALEY, pā'lĭ, FREDERICK APTHORP (1816-88). An English classical scholar, born at Easingwold, near York. He was educated at Saint John's College, Cambridge, where he lived from 1838 to 1840, when he left the university on account of his conversion to the Roman Catholic faith. Subsequently (1860) he returned to Cambridge, and remained there until in 1874 he was elected professor of classical literature in the Roman Catholic College at Kensington. He was classical examiner to Cambridge, London University, and the Civil Service Commission. A tireless student, he prepared numerous thoroughgoing and discriminating editions of the classics, including Æschylus, Euripides, Aristophanes, Propertius, and Pindar. It was chiefly as a verbal critic that he won recognition, and his original compositions in Latin and Greek were far superior to his few English renderings. Besides his literary studies, which attracted much attention in Germany, he published works on ecclesiastical architecture, including an excellent *Manual of Gothic Mouldings* (1845).

PALEY, WILLIAM (1743-1805). An English divine, born at Peterborough. He entered Christ's College, Cambridge, as a sizar at sixteen, and for the next two years led a dissipated life, but thereafter became a severe student, and took his bachelor's degree in 1763 with the highest honors. After teaching in a school for three years he was elected a fellow and afterwards a tutor of Christ's, and ordained in 1767. In 1776, upon his marriage, he was obliged to give up his fellowship and became rector of Musgrave, and later vicar of Dalston in Cumberland. In 1780 he was collated to a prebendal stall in the cathedral church of Carlisle; in 1782 he became archdeacon, and in 1785 chancellor of the diocese. The last of these years witnessed the publication of his *Principles of Moral and Political Philosophy*. In this work he propounds his ethical theory, which is a most remarkable mixture of utilitarianism and theology. Virtue was defined as "the doing good to mankind in obedience to the will of God, and for the sake of everlasting happiness." The will of God is discoverable "from Scripture and the light of nature combined." The light of nature is the tendency of actions to promote human happiness, the benevolence of the Deity being supposed. In 1790 appeared the *Horæ Paulinæ*, in which he aims to prove, by a great variety of 'undesigned coincidences,' the improbability, if not impossibility, of the hypothesis that the New Testament is a 'cunningly devised fable.' *A View of the Evidences of Christianity* was published in 1794. In his own day he was held to have achieved a splendid triumph over skeptics, and was handsomely rewarded. Several preferments came to him in rapid succession, until finally he obtained the rich rectory of Bishop-Wearmouth (worth £1200 per annum). After 1800 he became subject to a painful disease of the kidneys; but he continued to write, and in 1802 published perhaps the most widely popular of all his works, *Natural Theology, or Evidences of the Existence and Attributes of the Deity*, which, however, was to a large extent borrowed from a Dutch work. In natural theology he is well known on account of his shallow argument from design to the existence of God. Paley died May 25, 1805. A complete edition of his works was published in 1825 by one of his sons, the Rev. Edmund Paley. There are biographies by Meadley (London, 1809), and Lynam (ib., 1825). Consult: Stephen, *English Thought in the Eighteenth Century* (London, 1876); Albee, *History of English Utilitarianism* (ib., 1902).

PALFREY, pāl'frĭ, FRANCIS WINTHROP (1831-89). An American historian, born in Boston, son of J. G. Palfrey. He graduated at Harvard in 1851 and at the Law School two years afterwards. During the Civil War he rose to the rank of colonel and brevet brigadier-general, and in 1872 he was appointed register in bankruptcy. He published *A Memoir of William F. Bartlett* (1879); *Antietam and Fredericksburg*, in the "Campaigns of the Civil War Series" (1882); and contributed to the first volume of *Military Papers of the Historical Society of Massachusetts*, and the *North American Review*.

PALFREY, John Gorham (1796-1881). An American theologian and historian. He was born in Boston, May 2, 1796, graduated at Harvard in 1815, and studied for the ministry. In 1818 he was called to the pulpit of the Brattle Street Church (Congregational-Unitarian), Boston, and in 1831 to the chair of sacred literature at the Harvard Divinity School, where he remained till 1839. He was editor of the *North American Review* (1835-43), and in 1839 and 1842 gave a course of lectures before the Lowell Institute, Boston, on *The Evidences of Christianity*, which appeared in book form the next year. He was a member of the House of Representatives of the Massachusetts Legislature, 1842-43, and Secretary of the Commonwealth, 1844-48. He entered Congress as a Whig in 1847. He had already opposed the extension of slavery in a series of articles called *The Progress of the Slave Power* (1846); and in December, 1847, he declined to vote for Robert C. Winthrop, the Whig candidate for Speaker. This step, with his well-known anti-slavery principles, cost him his seat at the election of 1848, after a close contest. He soon joined the Free-Soil Party, was one of the editors of the *Commonwealth*, the Massachusetts organ of that party, and their candidate for Governor. He died in Cambridge, April 26, 1881. Dr. Palfrey published *Lectures on the Jewish Scriptures and Antiquities* (1838-52); *Sermons* (1834); *Elements of Chaldee, Syriac, Samaritan, and Rabbinical Grammar* (1835); and *The Relation Between Judaism and Christianity* (1854). But his reputation now rests upon his *History of New England During the Stuart Dynasty* (1858-75); abridged as *A History of New England from the Discovery by Europeans to the Revolution of the Seventeenth Century* (1866); again under title *A Compendious History of New England, from the Discovery by Europeans to the First General Congress of the Anglo-American Colonies* (4 vols., 1873). The closing part of the fourth volume in this edition was incomplete, and a fifth volume was published, *History of New England from the Revolution of the Seventeenth Century to the Revolution of the Eighteenth Century*, ed. by F. W. Palfrey (1890).

PALGHAT, pâl-gät'. A town and railway station in the District of Malabar, Madras, India, on the southern slope of the Nilgiri Hills, 26 miles southwest of Coimbatore (Map: India, C 6). It is at the foot of the Palghat Pass, which connects Travancore and Malabar by a military road and the Madras Railway. It has an extensive trade, and is noted for its educational institutions, including the Victoria Jubilee College, a law library, and a Swiss Protestant mission. Anciently of strategic value, Palghat was captured by the British in 1768, since when its military importance has declined, and its fortress, which still exists, has been abandoned. Population, in 1891, 39,481; in 1901, 44,177.

PALGRAVE, pal'grāv, Sir Francis (1788-1861). An English historian. He was born in London of Hebrew parentage, his father, Meyer Cohen, being a member of the stock exchange. He studied law and for a time was prominent in pedigree cases before the House of Lords. In 1823 he married, and on that occasion changed his faith and assumed the maiden name of his wife's mother, Palgrave. He became known as a literary antiquary by publishing some Anglo-Norman chansons. Gradually, however, he turned to the study of English history, and in 1831 published a *History of England*. In 1832 appeared his best work, the *Rise and Progress of the English Commonwealth*, and in the same year Palgrave also received the honor of knighthood. In 1838 he was appointed deputy keeper of Her Majesty's records, and held this office until his death. To him was due the gathering of the valuable records and their removal from their various insecure repositories to the great Public Record Office. In 1851 Palgrave published the first volume of his *History of Normandy and England*, but most of the work appeared after his death, which took place on July 6, 1861. As deputy keeper of the records, he published twenty-two annual reports. He also edited for the Record Commission the following works: *The Parliamentary Writs* (1827); *Essay on the Original Authority of the King's Council* (1834); *Rotuli Curiæ Regis* (1835). His historical works display a union of research, daring, and ingenuity. Nevertheless, they are not monumental, and they have been superseded by later works. The author lays great stress on the development of legal institutions, on which he was an authority; but his style is discursive, and the subject matter is badly arranged. Sir Francis Palgrave was the father of Francis Turner, William Gifford, Robert Henry Inglis, and Reginald Francis Douse Palgrave (qq.v.).

PALGRAVE, Francis Turner (1824-97). An English poet and critic. He was born at Great Yarmouth, was educated at Charterhouse and in Balliol and Exeter colleges, Oxford; served for five years as vice-principal of the training college for schoolmasters at Kneller Hall, and afterwards until 1884, when he retired, was successively examiner and assistant secretary in the education department. In 1885 he succeeded John C. Shairp in the Oxford professorship of poetry. He was the author of *Idylls and Songs* (1854); *Essays on Art* (1866); *Hymns* (1867); *Lyrical Poems* (1871); and *Landscape in Poetry* (1897); but is best known as the scholarly editor of such admirable collections as the *Golden Treasury of English Lyrics* (1861); *Sonnets and Songs of Shakespeare* (1877); *Selected Lyrical Poems of Herrick* (1877); *Selected Lyrical Poems of Keats* (1885); and the *Treasury of Sacred Song* (1889).

PALGRAVE, Sir Reginald Francis Douse (1829—). An English writer, born in London, June 28, 1829. He was educated at Charterhouse School and became a solicitor in 1851. Entering the committee office of the House of Commons as a clerk in 1853, he was appointed examiner of petitions for private bills to both Houses (1866), then second clerk assistant (1868-70), and clerk assistant (1870-86), and finally clerk of the House of Commons (1886-1900). He was knighted in 1892. His books include: *The House of Commons: Illustrations of Its History and Practice* (1877); *The Chairman's Handbook* (1890); *Oliver Cromwell* (1890). He also edited the first two books of Sir T. E. May's *Treatise on the Law of Parliament* (1893).

PALGRAVE, Robert Harry Inglis (1827—). An English economist. He was born at Westminster, was educated at the Charterhouse, and went into banking. From 1877 to 1883 he

edited *The Economist*. He wrote: *Local Taxation of Great Britain and Ireland* (1871); *Notes on Banking* (1873); *Bank Rate in England, France, and Germany* (1880); and contributions to the *Dictionary of Political Economy* (1900), of which he was editor.

PALGRAVE, William Gifford (1826-88). An English traveler and diplomatist. He was born in Westminster, won the Charterhouse medal for classical verse, and obtained an open scholarship at Trinity College, Oxford. He served in the Indian army as a lieutenant in the Eighth Bombay native infantry. In 1853 he resigned his commission, entered the Jesuit Order, and after courses of study at Laval and Rome, voluntarily joined the Syrian mission. Here he acquired such knowledge of Arabic language and manners as to be able thereafter to pass as a native. This guaranteed his safety in a perilous expedition through Central Arabia (1862-63), undertaken under commission of Napoleon III., and described in the admirable *Narrative of a Year's Journey* (1865). Having withdrawn from the Jesuit Order, in 1865, he went on a special governmental mission to Abyssinia, held various consulates in 1866-79, and in 1884 received appointment as Minister Resident to Uruguay, where he died. Among his works are: *Essays on Eastern Questions* (1872); *Hermanu Agha* (1872); and *Dutch Guiana* (1876).

PALI, pä'lē (Skt., line, series, sacred text). The language and literature of primitive Buddhism (q.v.), now represented in Ceylon, Burma, and Siam. Strictly speaking, Pali is the name of the literature only, which is so called because it is regarded as a series of sacred texts. The language itself was called *Pālibhāsā*, 'language of the series,' or *Māgadhibhāsā*, 'language of Magadha' (q.v.). It appears, however, to have formed a linguistic belt along the northern slope of the Vindhya Mountains. It is not impossible that its centre was in the city of Ujjain (q.v.), where the first great patron of Buddhism, Aśoka (q.v.), had been governor before he ascended the throne. Thence the language was carried to Ceylon by the Buddhist missionaries. Pali may be divided into two groups, that of the inscriptions and that of the literature. Of these the inscriptional Pali is the older. Its earliest records in India are in the inscriptions of Aśoka, and date from the third quarter of the third century B.C., and the youngest are as late as the tenth century A.D. In Ceylon the oldest inscriptions cannot be dated before the first century B.C. The relation of Pali to the other languages of India is in some respects uncertain. It is clear, however, that it is not a corruption of classical Sanskrit, but is descended from a dialect closely akin to Vedic Sanskrit. (See Sanskrit Language.) There is much evidence for the view that Pali was the language of India between the Himalayas and the Vindhyas before the rise of classical Sanskrit. Sanskrit inscriptions are not common before the first century B.C., and it was not until the fourth century A.D. that Pali inscriptions, except for a few, chiefly archaistic in character, were superseded by those in Sanskrit. Many proper names in Megasthenes (about 300 B.C.) and other classical authors, are evidently Pali, while others are as plainly Sanskrit. Epigraphical evidence further leads to the view that the classical Sanskrit originated in the region which was bounded by the Ganges and the Jumna, and which stretched between these rivers from the Himalayas to Muttra. From this country classical Sanskrit spread, superseding Pali and the other Indo-Germanic folk-dialects of India. On the other hand, it must be borne in mind that classical Sanskrit was at an early date a language of high culture, and that it was fixed in its literary form by Panini (q.v.) as early as B.C. 300. Again, the resemblances between Pali and Prakrit (q.v.) are so close that Pali may be regarded merely as a Prakrit dialect (see Prākrit), and the Prakrits long survived as literary and doubtless, also, as spoken languages, so that not only is Prakrit found in the Hindu drama, but we have a collection of Prakrit poems by Hala, probably about A.D. 1100. It would appear, therefore, that Pali and the later Prakrits existed contemporaneously with classical Sanskrit, which was the language of the higher classes and of literature, while Pali was vernacular and sectarian in use. Within Pali itself the existence of a number of dialects may be inferred from the epigraphical remains.

As contrasted both with Vedic and with classical Sanskrit, Pali, like Prakrit, shows a marked decadence both in phonology and in morphology. As a few of the most striking deviations from the Sanskrit phonology found in Pali, and frequently also in Prakrit, may be mentioned: The loss of *r*, as Sanskrit *vṛddha*, 'large,' Pali *vaddha*, *riddha*, *buḍḍha*, *ruddha*, Prakrit *vaddha*, *viḍḍha*, *vuḍḍha;* the frequent change of dentals to cerebrals, as Sanskrit *dahati*, 'burns,' Pali *ḍahati*, Prakrit *ḍahaï;* the occasional change of *d* to *l*, as Sanskrit *dōhada*, 'longing of a pregnant woman,' Pali *dōhala*, Prakrit *dōhula*, *dōhada;* the change of Sanskrit *ś*, *ṣ* to *s*, as Sanskrit *śōbhati*, 'is beautiful,' Pali *sobbhati*, Prakrit *sōhai*, Sanskrit *vṛṣabha*, 'bull,' Pali *vasabha*, Prakrit *vasaha;* the avoidance of consonant-groups, usually by assimilation, but occasionally by the insertion of an epenthetic vowel, as Sanskrit *bhakta*, 'boiled rice,' Pali and Prakrit *bhatta*, Sanskrit *ślāghā*, 'praise,' Pali *sīlāghā*, Prakrit *salāhā*. Inflection in Pali closely resembles that of classical Sanskrit, except that the aorist, comparatively rare in classical Sanskrit, occurs not infrequently in Pali. Pali has no distinctive alphabet, but is written according to locality in Cevlonese, Burmese, or Cambodian script. The Devanagari (q.v.) writing is never employed.

Pali literature is almost entirely religious. The greatest work in it is the *Tripitaka*. Of much importance are the *Visuddhi Magga*, or Way of Purity, by Buddhaghosa, a treatise on Buddhist doctrine dating from the fourth century A.D., and the *Milindapañha*, or Questions of Milinda (q.v.), which was probably composed about the beginning of the Christian Era. There are further a number of historical works, which have an increased interest from the fact that Sanskrit literature (q.v.) is almost without authentic histories. Among the most important works of this class in Pali are the *Mahāvansa* (q.v.), or Great History, and the *Dīpavansa* (q.v.), or History of the Island (of Ceylon). There is an abundant literature besides, including not only religious and historical writings, but also metrics, grammar, and lexicography.

Consult: Burnouf and Lassen, *Essai sur le Pali* (Paris, 1826); Minayef, *Grammaire Palie*, translated by Guyard (ib., 1874); Kuhn,

Beiträge zur Pali-Grammatik (Berlin, 1875); Frankfurter, *Handbook of Pali* (London, 1883); Müller, *Simplified Grammar of the Pali Language* (ib., 1884); Tilbe, *Pali Grammar* (Rangoon, 1899); Oung, *Grammar of the Pali Language* (Akyab, 1899-1903); Childers, *Pali-English Dictionary* (London, 1875); Torp, *Floxion des Pali in ihrem Verhaltniss zum Sanskrit* (Christiania, 1881); Franke, *Geschichte und Kritik der einheimischen Pāli-Grammatik und Lexikographie* (Strassburg, 1902); id., *Pāli und Sanskrit* (ib., 1902); Takakusu, *Pāli Chrestomathy* (Tokio, 1900); Andersen, *Pāli Reader* (London, 1901).

PALIKAO, pä'lē'kä'ō'. CHARLES GUILLAUME MARIE COUSIN-MONTAUBAN, Count of (1796-1878). A French general and statesman, born in Paris. After serving with distinction in Spain, and for twenty years in Africa, he was created a general in 1855. In 1860 he was placed in command of the French and English forces sent to China, and with relatively insignificant forces captured the forts at Taku, and after gaining a decisive victory at Palikao he entered Peking at the beginning of October of the same year. The Chinese Government was forced to accept his terms, and the conditions of peace were rigidly enforced. On his return to France in 1861, Napoleon III. presented him with the grand cross of the Legion of Honor, and gave him the title of Count. After the first defeats of the French army in 1870 he succeeded Ollivier as Premier, was at the same time Minister of War, and was consequently associated with the misfortunes that followed the French army. He published a history and defense of his administration in 1871. He died January 8, 1878, in Paris.

PALIL'IA, or **PARILIA**. An ancient Roman feast in honor of Pales (q.v.), celebrated on April 21st, and of such importance that its date was deemed the anniversary of the founding of Rome.

PAL'IMPSEST (Lat. *palimpsestus*, from Gk. *παλίμψηστος*, scraped again, from *πάλιν*, *palin*, again + *ψηστός*, *psēstos*, scraped, from *ψῆν*, *psēn*, to rub smooth). The name given to parchment, papyrus, or other writing material, from which, after it had been written upon, the first writing was wholly or in part removed in order that the page might be made available a second time. The ink used on papyrus and sometimes on parchment was commonly of soot mixed with gum and thinned with water, or else the liquid of the cuttlefish. This could be washed out with a sponge, and the latter was part of the writing equipment. Where this ink has been used, there is usually no trace of the original writing if the manuscript has been used again. Later for parchment, ink made from gall-apples, sometimes with the addition of vitriol, or metallic substances, was used. This took hold of the vellum, and for removal required the use of pumice, or of a mixture of milk, cheese, and lime to soften the parchment. Sometimes the knife was used, of course to the complete destruction of the writing. The processes employed were not always very complete, nor were they carefully carried out, and as a result in a number of cases the earlier writing is still more or less legible. The fragile character of papyrus made it difficult, if not impossible, to wash out writing of long standing, though the sponge was probably used while the ink was fresh. Since on papyri, as a rule, the writing was only on the *recto*, the back was frequently used to receive later writing. In the case of parchment, especially when bound in books, erasure was needed for a second use. The practice was common in classical times, and is frequently mentioned in the ancient writers, though in some cases it may be doubted whether the reference is not to wax tablets. In general, these old palimpsests were used as note-books or for rough drafts. The relative scarcity and cost of papyrus or vellum undoubtedly was responsible for this custom, and, with the disuse of papyrus and increasing demand for parchment, the habit of using old books increased in the East and West. Though vellum began to supersede papyrus for important works in the fourth century of our era, it was not till the seventh century, when the Arab conquest shut off the supply, that it became practically the only material in use, and it is from that time that palimpsests begin to increase. In the East, in 691, a Greek synod forbade the destruction of manuscripts of the Bible or of the Fathers, unless they were already damaged, and in the West much use was made of old manuscripts from the seventh to the ninth century, when, in consequence of the disturbed state of the country, there was some scarcity of material, and the old volumes of neglected authors were used for more popular works. Some writers have ascribed this to the indifference and even to the hostility of the monks and clergy to classical literature, and have attributed to their reckless destruction of classic manuscripts, in order to provide material for their own service-books and legendaries, the deficiencies in the remains of ancient learning which scholars have now to deplore. That some part of the loss may have so arisen it is impossible to doubt, although it is equally certain that we owe to the mediæval monks and clergy the preservation of a large part of the surviving ancient literature. Moreover, it seems probable that in general damaged copies were drawn upon for palimpsests, and in some cases the writing was not erased till the sheets had been resewn. It is said that no palimpsest shows that it originally contained a complete work under the later writing, though in some cases the amount preserved is very large. It should also be noted that in not a few cases the Bible or Church Fathers are found under classical or late texts, so that convenience, not hostility, seems in general to have determined the choice of material for erasure. While the practice continued even down to the sixteenth century, and in at least one case cleaned parchment was used for a printed book, most of the valuable Latin palimpsests are earlier than the tenth century, when it was possible to use the fine parchment of earlier times. In the East the practice was much more general, and the best palimpsests are of a later period. In fact, it is said that a relatively large proportion of existing Greek manuscripts are on reused vellum. While many of these are of Eastern manufacture, not a few show that the upper writing was done in Italy and the West. The natural result of these factors is that in general the palimpsests yield fragments, whose value lies largely in testimony to the early state of the text. In biblical criticism some very important results have been obtained from early palimpsests, and in classical

literature such palimpsests as the Codex Ambrosianus of Plautus have unique value. Most important of course are the rare cases where a lost work may be recovered from a palimpsest, as in the case of the *Republic* of Cicero, or the *Institutes* of Gaius.

It will easily be understood, therefore, that the chief, if not the sole, interest of palimpsest manuscripts lies in the ancient writing which they had contained, and that their value to literature mainly depends on the degree of legibility which the ancient writing still retains. Very commonly the original writing is much larger than the modern; the modern lines and letters do not cover those of the old manuscript, but follow the same order. In other specimens the new writing is transverse, and in some the old page is turned upside down. Sometimes, where the old page is divided into columns, the new writing is carried over them all in a single line; sometimes the old page is doubled, so as to form two pages in the new manuscript. Sometimes it is cut into two or even three pages. The most perplexing case of all for the decipherer is that in which the new letters are of the same size, and are written upon the same lines with those of the original manuscript. In the case of Latin palimpsests, it is generally true that lower minuscule writing, when legible at all, is scarcely worth the trouble of reading. The valuable manuscripts are in capitals or uncials. Some variety, also, is found in the language of the palimpsests. In those which were originally found in the Western libraries the new writing is almost invariably Latin, while the original is sometimes Greek, and sometimes Latin. In the palimpsests discovered in the East the original is commonly Greek, the new writing being sometimes Greek, sometimes Syriac, sometimes Armenian.

The possibility of making use of palimpsest manuscripts in order to increase our store of ancient literature was suggested as far back as the days of Montfaucon; but the idea was not turned to practical account till the latter part of the eighteenth century. The first palimpsest editor was a German scholar, Dr. Paul Bruns, who discovered that one of the Vatican manuscripts was a palimpsest, the effaced matter of which was a fragment of the ninety-first book of Livy's *Roman History*, and printed this fragment at Hamburg in 1773. In the field of discovery thus opened by Bruns, but little progress was made until the following century, when Barrett of Trinity College, Dublin, published his palimpsest fragments of Saint Matthew, and when palimpsest literature rose to importance in the hands of the celebrated Angelo Mai (q.v.). The great historian Niebuhr about the same time applied himself to the subject, and was followed by Blume, Pertz, Gaupp, Mommsen, Studemund, and other German scholars, whose labors, however, were for the most part confined to the department of ancient Roman law. Tischendorf's (q.v.) labors drew attention to the biblical texts thus preserved, and Cureton's examinations of Syriac and other Eastern manuscripts showed the importance of this field, where the most valuable result has been the discovery in the monastery at Mount Sinai of an early Syriac version of the Gospels under some lives of female saints.

Greek Palimpsests. Among these, the first place in importance belongs to the biblical palimpsests, the earliest of which was *Fragments of the Gospel of Saint Matthew*, in fac-simile as well as in ordinary type, printed from a palimpsest manuscript of Trinity College, Dublin, by Barrett (Dublin, 1801). The original writing appears to be of the sixth century. Barrett's transcript of the text was not in all respects correct, and a revised edition was published by Abbott in 1880. It is chiefly, however, to a collection of Syriac manuscripts brought from the East that we are indebted for the more recent palimpsest restorations of the ancient biblical readings. In this line the chief discoverer has been Tischendorf. Of these the best known is the celebrated *Codex Ephremi*, in the National Library, Paris. This manuscript had been early observed to be palimpsest, and the original Greek text was collated by Wetstein in 1716. It was completely published by Tischendorf, the New Testament in 1843, and the Old in 1845. The modern writing of this palimpsest consists of a Greek translation of works by Saint Ephrem the Syrian. Another palimpsest of interest is the *Codex Nitriensis*, in the British Museum, containing part of the Gospel of Saint Luke from the sixth century, part of the *Iliad* of about the same date, and a somewhat later Euclid, all used by a monk of the Nitrian monastery for a copy of a Syriac treatise. The number of these fragments constantly grows, and now probably about 30 Greek, Old Latin, and Gothic biblical palimpsests are known, of which the majority are Greek. As most of them belong to the fifth or sixth century, their testimony is often of great value.

In Greek classical literature the results from the palimpsests are not great. The Homer fragments are older than other parchment codices, but are outranked by the numerous papyri. A small part of the *Phaëthon* of Euripides is preserved in the *Codex Claromontanus* at Paris, and a collection of extracts from the later historians, containing some passages from lost works, has been published by Mai in his *Scriptorum Veterum Nova Collectio* (Rome, 1825-38). In Greek, however, no such discoveries have been made as in Latin, though it should be said that the Eastern libraries contain many palimpsests not yet carefully examined.

Latin Palimpsests. The first fragment of Latin literature printed from a palimpsest original is the portion of the ninety-first book of *Livy* already referred to, published at Hamburg and also at Rome in 1773. It was reëdited in a more complete form by Niebuhr in 1820. Of the Latin palimpsests edited by Mai, the earliest were some fragments of lost orations of Cicero from two different palimpsests in the Ambrosian library at Milan, in the later of which the second writing consisted of the acts of the Council of Chalcedon. These orations were published in two successive volumes in 1814. He also published eight orations of Symmachus (1815) and the comedies of Plautus, including a fragment of the lost play entitled *Vidularia* (1815). This is the celebrated *Codex Ambrosianus* in Milan, which has since been studied by Ritschl and other Plautine scholars, notably Studemund (Berlin, 1889). Mai likewise edited the works of M. Cornelius Fronto, together with the epistles of Antoninus Pius, Lucius Verus, M. Aurelius, and others (1815), as well as the celebrated dialogue of Cicero, *De Republica*, from a palimpsest

of the Vatican, the modern writing on which is the commentary of Saint Augustine on the Psalms (1821). Soon after the *De Republica* he published another volume from palimpsest sources, the most important of whose contents were some fragments of ancient Roman law, which prepared the way for the more distinguished success of Niebuhr, who, in a palimpsest of the library of Verona, recognized a portion of an ancient work on Roman law, afterwards identified as the *Institutiones* of Gaius. The text was deciphered by Göschen and others, and the first edition published at Berlin in 1820. A careful new collation was published by Studemund in 1874, and a text edition carefully revised by Krüger and Studemund (4th ed. Berlin, 1899). The latest considerable Latin publication in this department is *Gai Granii Liciniani Annalium Quæ Supersunt* (Berlin, 1857), edited from a palimpsest of the British Museum by the younger Pertz. This palimpsest, as was already stated, is a thrice-written codex, the earliest and original contents being the *Annales* of Granius Licinianus, a writer of the second century A.D. The second writing was also in Latin, and the work is a grammatical treatise, of which the chapters *De Verbo* and *De Adverbio* are still legible. The most modern writing is Syriac, written in the cursive character.

It will be gathered from the above that the ancient works recovered by means of palimpsest manuscripts are all fragmentary, and one might be led to rate at a low value the result thereby obtained. Yet such works as the *Republic* of Cicero, the *Institutes* of Gaius, and the very early text of Plautus in the Ambrosian palimpsest are of priceless value. And it must be remembered that in some of the departments to which these palimpsestic fragments belong every scrap, no matter how trifling, has an independent value. In biblical remains, for example, a single text may present a valuable reading, the merest fragment may throw light on an important critical question. In history, in like manner, a small fragment may disclose an interesting fact, or supply a significant commentary upon facts otherwise ascertained. And as regards critical uses especially, it must not be forgotten that the obliterated text of the palimpsest manuscripts for the most part far exceeds in antiquity the very oldest known codices which we possess, and is, probably, second only in age to the papyri of Herculaneum.

The method of treating palimpsest manuscripts, with a view to deciphering their contents, has been fully described by different editors. Mai, after having washed the palimpsest with an infusion of galls, exposed it to the light and air, and, generally speaking, found this sufficient for his purpose. Peyron washed the parchment in water, afterwards in dilute muriatic acid, and finally in prussiate of potash. A mixture compounded on this principle is called from its inventor, M. Gioberti, *tinctura Giobertina*. Sometimes the treatment does not succeed equally well on both sides of the parchment, the outer surface, from its softer texture and more thorough erosion, yielding poorer results. When the ink contained animal substances, as milk, or the blood of the cuttlefish, Mone plunged the parchment into a close vessel filled with oil, which he heated to a temperature of 400° R. But almost, if not quite, all of the earlier processes have resulted, after the course of some years, in such darkening, and sometimes corrosion of the surface of the manuscripts treated, as to make them quite illegible and worthless. Von Sickel recommended an apparently harmless process, that of washing the pages of the manuscript discreetly with a potash, soap, and then immersing them in clear water, from which treatment they take no injury if they are carefully dried afterwards. Pringsheim published the details of a process purely photographic, whereby, through successive photographings, the effect on the plate of the later writing is weakened, and that of the earlier and fainter hand is intensified, until the erased writing becomes legible in the negative.

Consult: Mone, *Lateinische und griechische Messen* (Frankfort, 1850); id., *De Libris Palimpsestis tam Latinis quam Græcis* (Karlsruhe, 1855); Wattenbach, *Das Schriftwesen im Mittelalter* (3d ed., Leipzig, 1896). See PALÆOGRAPHY.

PAL'INDROME (Gk. παλινδρομος, *palindromos*, a running back, from πάλιν, *palin*, back + δρόμος, *dromos*, a running, from δραμεῖν, *dramein*, to run). A name given to a kind of verse the peculiarity of which is that it reads the same backward as forward. It is very common in Latin. Examples are:

Si bene te tua laus taxat sua laute tenebis,
Et necat eger amor non Roma rege tacente,
Roma reges una non anus eger amor.

In this, *eger* is the mediæval spelling for *æger*. To a Roman lawyer is credited the following:

Si nummi immunis.

which Camden translates:

Give me my fee, and I warrant you free.

Consult: Wheatley, *Anagrams* (Hartford, 1862); Clark, *Palindromes* (Glasgow, 1887).

PAL'INGENE'SIA (ML., from Gk. παλιγγενεσία, new birth, from πάλιν, *palin*, again + γένεσις, *genesis*, birth). A term that appears to have originated among the Stoics, who employed it to denote the act of the *demiurgus*, or creator, by which, having absorbed all being into himself, he reproduced it in a new creation. The occurrence of the word in the New Testament (Titus, iii. 5, where it is used to denote regeneration) has given it a place in Christian theology, and divines have variously used it to express the resurrection of men, the new birth of the individual soul, and the restoration of the world to that perfect state that it lost by the fall—"the new heavens and the new earth wherein dwelleth righteousness."

PAL'INGEN'ESIS (Neo-Lat., from Gk. πάλιν, *palin*, again + γένεσις, *genesis*, birth), and **CŒNOGENESIS.** The recapitulation theory (q.v.) or 'biogenetic law' is a statement of the general fact that the development of the individual is an epitome of that of the class to which it belongs. Haeckel, and Fritz Müller in substance before him, further distinguished two modes of operation of this law. To the first he gave the name 'palingenesis.' Briefly defined, it is the fact of the regular repetition of ancestral features caused by inheritance. Thus the shrimps and crabs in the egg pass through a nauplius stage, the embryo possessing the rudiments of only three pairs of appendages, but they hatch in an advanced larval condition called the zoëa. The lobster, on the other hand, before hatching passes through phases which recall the nauplius.

and also the zoëa stages, and the animal hatches in a more advanced stage than the zoëa, undergoing a partial metamorphosis. The toad or frog, in the embryo, pass through an ascidian, an Amphioxus, a fish, and a salamander stage, before they assume the tailless adult condition. The animal thus repeats in its own development certain (but not all) of the features which characterized its successively ascidian, Amphioxus-like, and fish-like ancestors.

The second phase or mode of operation of the law of recapitulation is 'cœnogenesis,' which means the modification of palingenesis by the inheritance of later acquired characters, the ancestral characters having been lost or crowded out, owing to the lapse of heredity. This was fully explained by Fritz Müller, his illustration being the metamorphosis of the more specialized insects, such as the butterfly, bee, and fly. The larval stages of these insects (caterpillar, maggot) are secondary. The most primitive insects were born in the shape of the parent, and passed through no larval stage. The primitive features of the ancestral insect have been lost, except the transitory indications of a series of abdominal legs, showing that the insects all descended from polypodous forms; but the caterpillar and maggot stages are recent acquisitions, and to this phenomenon the term cœnogenesis (or recent genesis) is applied. As Müller expressed it: In contradistinction to the *inherited* metamorphosis of the prawns, we may call that of the Coleoptera, Lepidoptera, etc., an *acquired* metamorphosis. He then goes on to show at some length that the 'complete' metamorphosis of insects was not inherited from the primitive ancestor of all insects, but acquired at a later period. See RECAPITULATION THEORY.

Consult: Fritz Müller, *Facts for Darwin* (London, 1869); Haeckel, *Generelle Morphologie* (Berlin, 1866); Hyatt, *Phylogeny of an Acquired Character* (Philadelphia, 1894); Lang, *Textbook of Comparative Anatomy*, vol. i. (New York, 1891).

PALINURO, pä'lē-nōō'rō, CAPE, or CAPE SPARTIMENTO. A promontory on the coast of Lucania, Italy, projecting into the Tyrrhenian Sea, northwest of the entrance to the Gulf of Policastro (Map: Italy, K 7). It was named in honor of Palinurus (q.v.), the pilot of Æneas, said to have been buried here, where some ruined walls bear the name of his tomb. In B.C. 253 and in B.C. 36 Roman fleets were wrecked on this point.

PAL'INU'RUS. A pilot of Æneas. When the Trojans were approaching the coast of Italy, he slept and fell overboard. The ghost of Palinurus appeared to Æneas on his visit to Hades, and said that he had been washed ashore and murdered by the natives. In accordance with the promise of the Sibyl, his body received suitable burial.

PALISA, pä'lē-sä, JOHANN (1848—). An Austrian astronomer, born at Troppau. He was assistant in the Vienna observatory (1870), and in the observatory at Geneva (1871), and director of the Marine Observatory at Pola until 1880, when he became adjunct in the Vienna Observatory. Before the use of photography Palisa discovered more than 50 asteroids and made special research on comets, mostly published in the *Astronomische Nachrichten* (1871 et seq.). His valuable charts based on observations were begun in 1878.

PALISADE CELLS (Fr. *palisade*, from *palisser*, to inclose with pales, from OF. *palisse*, *palis*, *palice*, from ML. *palitium*, paling, from *palus*, pale). The green working cells (*mesophyll*) upon the more exposed side of foliage leaves. Since these cells become elongated and stand close together, with their long axes at right angles to the epidermis, this arrangement suggested the name. See LEAF.

PALISADES. The name given to the line of cliffs that extend along the western shore of the Hudson River from near Haverstraw, N. Y., to Weehawken, N. J., a distance of about 30 miles. The cliffs for most of this distance rise almost directly from the water's edge in a single escarpment which simulates a wall of masonry and lends a characteristic and picturesque effect to the scenery in this section of the Hudson Valley. Their height ranges from 200 to 550 feet. They are formed by the outcrop of a thick sheet of diabase which was intruded while in a molten condition between sandstones and shales of the Newark system. The overlying strata have been partially removed by erosion, and the harder igneous rock now stands exposed in the form of a ridge along the eastern edge of the sheet. The scarp wall of the Palisades is a complex fault (q.v.). Extensive accumulations of talus are found in places. The fissure through which the molten rock rose toward the surface is situated near the western edge of the sheet. The slope toward the west is for the most part very gradual. See HUDSON RIVER.

PALISOT DE BEAUVOIS, pä'lē'zō' de bō'vwä', AMBROISE MARIE FRANÇOIS JOSEPH (1752-1820). A French naturalist, born at Arras. He became a corresponding member of the Academy of Sciences in 1781, and five years later set out on a journey, during which he visited West Africa, Santo Domingo, and North America. He returned to France in 1798, succeeded Adanson at the Institute in 1806, and in 1815 became a member of the council of the University of Paris. Among his works are: *Flore d'Oware et de Bénin* (1804-21); *Insectes recueillis en Afrique et en Amérique* (1805-21); *Essai d'une nouvelle agrostographie* (1812); *Muscologie, ou traité sur les mousses* (1822).

PALISSY, pä'lē'sē', BERNARD (c.1510-89). A celebrated French art potter, scholar, and author, born at La Chapelle Biron, near Agen (Lot-et-Garonne). The son of a poor workman in glass, his education was limited, but by his own studious efforts he acquired a considerable knowledge in the natural sciences, besides geometry, drawing, and painting, and extended it while traveling for a period throughout France, in Flanders, and on the Rhine. In 1539 he married and settled at Saintes, where he practiced glass and portrait painting, at the same time carrying on the business of a land surveyor. An enameled cup of faïence which he saw by chance inspired him with the resolution to discover the mode of producing white enamel. Neglecting all other labors, he confined himself to investigations and experiments for sixteen years, exhausting all his resources until, unable any longer to buy fuel, he was reduced to the necessity of burning his furniture piece by piece, and finally the flooring of his rooms. Scoffed at by his

neighbors, overwhelmed with reproaches by his wife, and besought by his starving family crying for food, he nevertheless persisted in the search, and at length his efforts were crowned with success. A few pieces adorned with figures of animals, colored to represent nature, sold for high prices, after which he became famous and was patronized and encouraged by the royal family and the nobility, who employed him to embellish their mansions with specimens of his art. An enthusiastic follower of the Huguenot cause, he was arrested in 1562 and imprisoned at Bordeaux, but was soon released by order of the King, who gave him a patent as inventor of 'figulines rustiques.' He removed to Paris about 1564, and set up his pottery-works on a plot of ground assigned to him near the Tuileries. There he worked and prospered for years, escaping the Massacre of Saint Bartholomew's under the protection of Queen Catharine de' Medici, and in 1575 began a course of lectures on natural history and physics, which were attended by all the learned men of the day and made him prominent as a man of science. Many of his views of nature have been supported by subsequent discovery and investigation, and have made good his title to a very high rank among the natural philosophers of the sixteenth century. On a fresh outburst of religious fanaticism in 1587, he was thrown into the Bastille as a heretic, and condemned to death, but died before the sentence was carried out. The faience of Palissy is of a peculiar style. His figures and other ornaments are all executed in colored relief, the colors being usually bright, but not of great variety, blues, grays, and yellows prevailing. The most remarkable of his productions are the 'pièces rustiques,' dishes ornamented with crayfish, frogs, lizards, fishes, snakes, shells, and plants, admirably true to nature in form and color. Magnificent specimens of his work are in the Louvre, the Musée de Cluny, and at Sèvres. A few may be seen in the South Kensington and British museums, but the Fountaine Collection at Narford Hall, England, is hardly equaled by any even in France. His *Œuvres complètes*, edited by France (Paris, 1880), containing also a most stirring autobiography, fully justify Lamartine's verdict assigning to Palissy a high position among French writers. For his life and work, consult Henry Morley (London, 1852), Audiat (Paris, 1868), Burty (ib., 1886), and Dupuy (ib., 1898); consult also: Delange and Borneman, *Monographie de Faurre de Bernard Palissy* (Paris, 1862), and Marryat, *A History of Pottery and Porcelain* (3d ed., augmented, London, 1868).

PALITZSCH, pä'lich, Johann Georg (1723-88). A German astronomer, born at Prohlis, near Dresden. On Christmas night, 1758, he discovered, a month before any one else, the comet usually called Halley's, and in 1782 simultaneously with Goodrike determined the period of variation in Algol, a star in Perseus. Palitzsch made his own instruments and continued to live as a peasant in the country near Dresden.

PALIZZI, pä-lēt'sē, Giuseppe (1812-98). An Italian landscape and animal painter, born at Lanciano, in the Abruzzi. He studied in Naples, and under Troyon in Paris, where he afterwards lived. His works, usually of Italian subjects, are notable for energetic treatment and fine color. They include "Goats in the Vineyard" (1855), and "Goats of the Abruzzi," in the Montpellier Museum. His brother, Filippo Palizzi (?-1899), born at Vasto, in the Abruzzi, was one of the ablest of those Neapolitan painters who, in the second half of the nineteenth century, did so much to revive Italian art.

PALK STRAIT. The northern portion of the passage between the south coast of Hindustan and the island of Ceylon (Map: Asia, H 8). This passage is continued southward by the Gulf of Manar (q.v.). It is from 40 to 80 miles wide, 80 miles long, and so shallow that it cannot be navigated in safety by large vessels.

PALL (Lat. *palla*, robe, mantle, curtain). A small square, generally of cardboard, covered on both sides with fine linen, which is used in the Roman Catholic Church to cover the chalice during the mass. It seems to have evolved from a fold of the corporal (q.v.), which in earlier times was turned back over the chalice; this custom, which maintained itself as late as the twelfth century, is still preserved in the Carthusian Order, and a trace of it remains in the fact that the Pontifical has no separate form for blessing the pall as distinct from the corporal. The Theatines use a second pall on which to lay the host; and in the Greek rite also two are used, one to cover the chalice, the other the paten. The name is also applied to a covering of black or purple (sometimes white for young persons) thrown over a coffin while it is being carried to burial.

PALL. A bearing in heraldry (q.v.). See also Pallium.

PALLA, pä'lä, or Impalla (South African name). A South African antelope (*Epyceros melampus*), called 'rodebok' by the Dutch, because reddish. It is a wood-loving species and fond of water; and in former days gathered into large herds in winter, when this species furnished the principal food of the lion and leopard. Consequently these antelopes were exceedingly suspicious, and were not only hard to shoot, but were likely to alarm all other game in the neighborhood by their shrill whistling as soon as they discovered the hunter. The genus is peculiar in having no dew-claws. The males alone have horns, which are lyrate with an abrupt angular bend in the middle.

PALLADIO, pä-lä'dē-ō, Andrea (1518-80). An Italian architect of the late Renaissance. He was born at Vicenza, November 30, 1518. He studied architecture in his native city, his patron, Trissino, enabling him to visit Rome, where he prepared himself by a thorough study both of Vitruvius and of ancient monuments, which he assimilated more thoroughly than any other architect of the Renaissance. His first great work was the magnificent two-storied arcade around the Basilica of Vicenza (1545). He produced many works of both civil and religious architecture in and near his native city, which he made a great architectural centre. His scientific treatise on architecture, *I quattro libri dell' architettura* (1570), attained immediate success. The precise rules and formulas, clearly expressed, carried his style not only throughout Italy, but through Europe and Great Britain, where they found especial favor. Palladio became the standard bearer of late Renaissance architecture.

His strength lay rather in composition than in detail, and his originality was manifested in the knowledge, taste, and skill with which he reproduced the composition, proportions, and details of Roman architecture, and adapted them to the requirements of his time. The Basilica of Vicenza was epoch-making; so was his theatre (Teatro Olimpico). His palaces were equally characteristic. A few had two orders of columns, the finest of these being the Barbarano and Chierigiti palaces, in Vicenza. Of the more numerous palaces with but a single colossal order of pilasters or engaged columns standing on a rustic basement, the masterpiece is the Marcantonio Tiene Palace, which is finer even than the Porto and Valmarana palaces. Of his numerous villas the most famous is the Rotonda Capra, outside Vicenza, with circular hall in the centre and four Ionic façades; its interior ornaments in stucco are especially fine. In Venice his works were all ecclesiastical; the earliest was the atrium in front of the Church of La Carità, the church itself coming later; then came the refectory and later the Church of San Giorgio Maggiore, with its beautiful tower (the façade being of later date, by Scamozzi); in 1562 the façade of San Francesco della Vigna; and in 1578-80 the Church of Il Redentore—all of them marked by great dignity and refinement of composition. His Vicentine buildings have suffered from being executed in brick, stucco, and wood, instead of stone. Consult: Scamozzi, *Fabbriche di Palladio* (Venice, 1786); and the monographs by Temanza (Venice, 1762), Boito (Milan, 1883), Melani, in *L'Art* (Paris, 1890), and Fletcher (New York, 1902).

PALLADIS TAMIA. See MERES, FRANCIS.

PALLA'DIUM (Lat., from Gk. Παλλάδιον, *Palladion*). Among the Greeks, an image of the protecting divinity of a city, on whose preservation the safety of the town was believed to depend. In general, these images seem to have had the form of armed figures, usually with shield and spear, of rude workmanship, often scarcely more than a mere column, but gradually assuming the type of the Athena Promachos, the colossal bronze statue on the Acropolis at Athens. They were early identified with that goddess, and their name is connected with hers, Pallas. Such images are seen even on Mycenæan gems and paintings, and are frequent in later works of art. In literature the great example is the Palladium of Troy, believed to have fallen from heaven, like many another palladium or venerable cult-image. This was stolen by Odysseus and Diomedes, and its subsequent fate was the subject of many different legends, since various cities desired to show that they possessed the original. With the acceptance by the Romans of the belief in their descent from the Trojans arose the belief stated by Varro that the Palladium, which was kept in absolute secrecy in the house of Vesta, was the Trojan original and had been brought to Italy by Æneas. Consult Chavannes, *De Raptu Palladii* (Berlin, 1891).

PALLADIUM (Neo-Lat.). A metallic element discovered in 1803 by Wollaston, who named it from the planetoid Pallas, which had been discovered by Olbers in 1802. It is found in grains usually containing platinum and iridium in the proportion of about 2 per cent., and with gold and silver in the proportion of 5 to 10 per cent.; also with gold and lead selenide in the Harz. The principal sources are the platiniferous sands of Brazil, the Urals, and other localities where platinum ores are found. For its separation the ore is dissolved in aqua regia; the solution is kept boiling for some time with an excess of caustic soda, then acidified with hydrochloric acid and precipitated with ammonium chloride; the filtrate is then boiled with copper foil, the metallic powder thus obtained is extracted with nitric acid, and metallic palladium is precipitated from the nitric acid solution by shaking the latter with metallic mercury.

Palladium (symbol, Pd; atomic weight, 106.36) is a white lustrous metal with a specific gravity of 11.4 at 22.5° C. It melts at about 1500° C., and is fairly malleable and ductile. It is remarkable for its capacity for absorbing hydrogen. The metal itself is used for making scales and division marks on scientific instruments and for coating and preserving silvered ware. The wire finds some use in dentistry on account of its hardness. An alloy of palladium with steel is used in making parts of physical instruments.

Palladium combines with oxygen to form a suboxide (Pd_2O), a monoxide (PdO), and a dioxide (PdO_2), but none of its salts has any important application.

PALLA'DIUS. An early Christian writer. He is supposed to have been born in Galatia in the latter half of the fourth century. At the age of twenty he started on foot to visit the cells of the famous monks in different parts of the Roman Empire. He spent some time in Egypt in the Nitrian Desert, then went to Palestine and lived several years with the monks of the Mount of Olives. At the beginning of the fifth century he was consecrated a bishop in Asia Minor, but he is probably not the Palladius who was Bishop of Helenopolis in Bithynia. He was the author of a work addressed to Lausus, a chamberlain at the Imperial Court, and hence called *Historia Lausiaca*, which is a rich collection of pictures of the monkish life in Egypt and Palestine, based on personal knowledge, oral testimony, and probably also written sources. The existing manuscripts differ greatly and the text has not yet been established. It was published in the original Greek by Migne in *Patrol. Græca*, xxxiv., and in Latin translation in *Patrol. Latina*, lxxiii., lxxiv. Palladius was an adherent of Origen and an opponent of Jerome. He may also have been the author of a *Dialogus de vita S. Johannis Chrysostomi* (in Migne, *Patrol. Græca*, xlvii.). Consult Preuschen, *Palladius und Rufinus* (Giessen, 1897).

PALLADIUS, RUTILIUS TAURUS ÆMILIANUS. A Roman author, who probably lived in the fourth century A.D., under Valentinian and Theodosius. He wrote a work, *De Re Rustica* (On Agriculture), in fourteen books, the last of which is a poem of eighty-five elegiac couplets. It is, from a literary and grammatical point of view, full of faults; but, as it was a complete calendar of Roman agriculture, it was very useful for its time, and was much read and followed during the Middle Ages. The best edition is that by Schneider in his *Scriptores Rei Rusticæ Veteres Latini* (4 vols., Leipzig, 1795), and the most recent by Schmitt (ib., 1898). The

work of Palladius was translated into English by Owen (London, 1803).

PALLANZA, pä-län'tsä. A town in the Province of Novara, Italy, situated on a headland in Lake Maggiore, 45 miles northwest of Milan (Map: Italy, C 2). It is esteemed as a winter resort, owing to its mild climate and delightful situation. Population (commune), in 1901, 5237.

PAL'LAS. The Greek goddess of wisdom, identical with Athena. See MINERVA.

PALLAS, päl'läs, PETER SIMON (1741-1811). A German-Russian traveler and naturalist, born in Berlin. He studied natural history, and was employed in classifying many valuable collections in both Holland and England. In 1764 he was elected a foreign member of the Royal Society. He gained a high reputation by the publication of his *Elenchus Zoophytorum* (1766), a work still much valued, and *Miscellanea Zoologica* (1766). In 1768 the Empress Catharine II. invited him to Saint Petersburg, where he was made a member of the Academy of Sciences, and he was subsequently appointed naturalist to a scientific expedition bound for Siberia, the immediate object of which was to observe the transit of Venus. Pallas spent six years on his journey (1768-74), exploring in succession the Ural Mountains, the Kirghiz Steppes, a great part of the Altaian range, the country around Lake Baikal, and the steppes of the Volga, returning to Saint Petersburg in 1774 with an extraordinary treasure of specimens in natural history, which form the nucleus of the museum of the Academy of Saint Petersburg. His travels, *Reisen durch verschiedene Provinzen des russischen Reichs*, were published at Saint Petersburg (1771-76), and were followed by his *Sammlung historischer Nachrichten über die mongolischen Völkerschaften* (1776-1802), and his *Neue nordische Beiträge zur physikalischen und geographischen Erd und Völkerbeschreibung, Naturgeschichte und Ockonomie* (1781-96). Without neglecting any branch of natural history, he now devoted himself more particularly to botany; his magnificent *Flora Rossica* (1784-1815) and his *Species Astragalorum* (1800-02) were among the results of his studies. He published also *Icones Insectorum praecipue Rossiae Sibiriaque Peculiarium* (1718-98), and contributed to a glossary of all the languages of the Russian Empire, which was published at Saint Petersburg. As he wished to live in the Crimea, the Empress Catharine presented him with an estate in the finest part of that peninsula, where he resided after 1796. His *Bemerkungen aus einer Reise durch die südlichen Statthalterschaften des russischen Reichs* was published in 1799-1801. In 1810 he went to Berlin, where he spent the last year of his life.

PALLAVICINO, päl'lä-vē-chē'nō, SFORZA (1607-67). An Italian historian, son of the Marquis Alessandro Pallavicino of Parma. He was born at Rome, November 28, 1607. He took orders, and held several important ecclesiastical appointments during the pontificate of Urban VIII. In 1637 he became a member of the Society of Jesus, and was created a cardinal in 1659 by Pope Alexander VII. He died in Rome, June 5, 1667. In Latin he wrote theological and polemical works, such as the *Vindicationes Societatis Jesu* and the *Assertionum Theologicarum Libri*. Of his Italian works there may be mentioned the fragmentary *Fasti sacri* in octaves; the tragedy *Ermenegildo* (1644); the *Avvertimenti grammaticali a chi scrive in italiano* (1661), and the posthumously published *Della vita di Alessandro VII., libri cinque* (1839-40), one of his best works; and his correspondence (*Lettere*, recent ed., Rome, 1848). The most noted of all his writings is the *Istoria del Concilio di Trento ove insieme si rifiutasi con autorevoli testimonianze un' istoria falsa divulgata nell' istesso argomento da Pietro Soave Polano* (Rome, 1656-57; 2d ed. 1664). This work, written to do away with the history by Paolo Sarpi, has many decided merits, but, as Ranke has stated, it sins by being unduly partial.

Consult the *Opere edite ed inedite di Sforza Pallavicino*, containing in vol. ii. Affo's *Memorie della vita e degli studi del cardinale Sforza Pallavicino* (Rome, 1844-48).

PALLESKE, päl-lĕs'ke, EMIL (1823-80). A German author and dramatic reader, born at Tempelburg, Pomerania. He studied at the universities of Berlin and Bonn, then became an actor at Posen, and from 1845 until 1851 was attached to the Court theatre at Oldenburg. Subsequently he was widely known in Germany through his public readings of Shakespeare's dramas, later on also of selections from the works of Fritz Reuter. Besides three dramas he published *Die Kunst des Vortrags* (3d ed. 1892), but he owes his reputation as an author chiefly to his *Schillers Leben und Werke* (15th ed. 1900).

PAL'LISER, Sir WILLIAM (1830-82). An English soldier and inventor. He was born in Dublin, Ireland; was educated at Rugby, Trinity College, Dublin, Trinity Hall, Cambridge, and the Staff College, Sandhurst; and entered the rifle brigade as ensign in 1855. He was transferred to the hussars in 1858; retired from the service in 1871, and was knighted in 1873. He introduced a number of inventions, among them being the chilled projectiles known by his name, improvements in the manufacture of ordnance, and the process of converting smooth-bore guns into rifled ordnance. He was elected to Parliament in 1880.

PAL'LIUM (Lat., mantle, cloak). The name given in the Roman Catholic Church to an ecclesiastical vestment worn by the Pope, by patriarchs, and by archbishops. Its use is very ancient, and a respectable tradition carries it much further back than the earliest positive historical notice of it, in the life of Pope Marcus, a contemporary of Constantine the Great. By archbishops it cannot be worn until it has been solemnly asked for and granted by the Pope, and even then only at high mass on certain specified great festivals or on the occasion of important functions, such as the consecration of bishops or churches. The pallium is a narrow band of white woolen web, about three inches wide, embroidered with black crosses, which encircles the neck of the archbishop, and from which two narrow bands of the same material depend, one falling over the breast, the other over the back of the wearer. It is made by nuns wholly or in part from the wool of two lambs, which are blessed annually on the festival and in the Church of Saint Agnes. During the night before the feast of Saint Peter and Saint Paul the *pallia* made of this wool are placed on the

altar above the tomb of these Apostles. Within three months of his consecration every new archbishop is obliged to apply to the Pope, in person or by proxy, for the pallium; nor is it lawful for him, until he shall have received it, to exercise any act of what is properly archiepiscopal jurisdiction. Consult: Thurston, *The Pallium* (London, 1892); Vespasiani, *De Sacri Pallii Origine* (Rome, 1856).

PALL MALL, pĕl mĕl. The name of a street of London, famous for its clubs and palaces. The name is derived from the old game of *pall mall*, introduced during the reign of Charles I. Originally a suburban promenade, Pall Mall became a street at the close of the seventeenth century. Many important historical and literary personages have lived along its borders. Among the prominent clubs are the Athenæum, Travellers', Reform, Carlton, Army and Navy, Oxford and Cambridge, White's, and the Devonshire Club. The Crimean Monument, the York Column, and the statue of George III. and Sir John Franklin are the principal works of sculpture on the thoroughfare, upon which Her Majesty's Theatre and the Haymarket Theatre also front. The London House, the Winchester House, the Marlborough House, St. James's Palace, and the Spencer House are the principal places of note.

PALM (AS. *palm*, from Lat. *palma*, palm-tree, palm of the hand; connected with Gk. παλάμη, *palamē*, Skt. *pāni*, Olr. *lam*, OHG. *folma*, AS. *folm*, palm of the hand, and ultimately with OHG. *fuolen*, Ger. *fühlen*, AS. *fēlan*, Eng. *feel*; so called from the resemblance of the leaves to the outspread hand). The great tree group of about 130 genera and 1200 species of monocotyledons, displayed almost exclusively in the tropics, where they form a most striking part of the vegetation. Having been described chiefly from cultivated and incomplete specimens, the species are very inadequately understood, as may be seen from the fact that in a collection of Porto Rican palms, thirteen were new species and seven were new genera. The general habit of the palm, with its columnar trunk often buttressed at the base, sometimes rising more than 100 feet and crowned by a rosette of huge leaves, is well known. All palms, however, do not exhibit this habit, for some have branching stems (e.g. doom palm), some are but three or four feet high, and some have such long and slender stems that they are ropelike and climbing by means of hooked spines, as in the rattan palms. Some species have flexible stems which often attain a height of 500 and even 600 feet. Indeed, Rumphius asserts that they are sometimes 1200 or even 1800 feet long.

The leaves of palms are of two general kinds, the palmate or fan forms, and the pinnate or fern forms, for example, the date palm (*Phœnix dactylifera*) and the cocoanut palm (*Cocos nucifera*). Examples of the former are the common fan palm (*Livistona Sinensis*) and the palmetto (*Sabal Palmetto*) of the Southern States. In the latter some species produce leaves 50 feet long and 8 feet broad; in the former 30 feet long and 4 to 5 feet broad, undivided. The flowers occur in enormous clusters at first ensheathed by huge and frequently woody spathes which often burst with an explosion, and are usually more or less pendant from among the crown of leaves. Humboldt estimated the number of flowers on a single palm (a species, Elæis) to be about 600,000. The fruit is sometimes a kind of berry, sometimes a drupe, either with a fleshy or fibrous covering; and sometimes contains a very hard and bony nut. It is sometimes only of the size of a pea or a cherry; sometimes, as in cocoanut, notwithstanding the smallness of the flowers, it is of very large size. See Plate of PALMETTOS.

A few species are found in temperate regions; one species only, *Chamærops humilis*, being a native of Europe, and extending as far north as latitude 44°, while the northern limit of palms in Asia is about latitude 34°, and in North America, latitude 35°. In South America the southern limit of palms is latitude 36°; in Australia it is latitude 35°; in Africa no native species is found farther south than latitude 30°; but in New Zealand one species extends as far south as latitude 38°. Some of the species which are found in tropical America grow in mountain regions bordering upon the limits of perpetual snow. Some species are restricted to very narrow geographical limits. The cocoanut palm, which is by far the most extensively distributed, grows in maritime, others in inland, districts. Some grow on dry and sandy ground, others in the richest alluvial soil, and some in swampy situations; some in open districts, others in dense forests. Some species are generally found singly, some in groups; some even cover tracts of country in which no other tree appears.

There is almost no species of the palm which is not capable of being applied to some use, and in economic importance the order is excelled by no other order of plants except the grasses. For the vast variety of its products, see ARRACK; ASSAI; DATE; COCOANUT; OIL PALM; PALMYRA PALM; SAGO; RATTAN; ASTROCARYUM; PALMETTO; etc.

The classification of Drude of the suborders and principal genera is as follows: Phœniceæ—Phœnix; Sabaleæ—Chamærops, Sabal, Rhapis, Corypha, Livistonia, Copernicia; Borasseæ—Borassus, Lodoicea; Mauritieæ—Mauritia; Metroxyleæ—Raphia, Metroxylon, Calamus; Arecineæ—Caryota, Arenga, Leopoldinia, Ceroxylon, Oreodoxa, Euterpe, Areca; Cocoineæ—Elaïs, Attalea, Cocos, Bactris, Desmoncus; Phytelephantineæ—Phytelephas, Nipa.

The cultivation of palms in hot-houses is generally attended with great expense. In hot-houses they are cultivated merely as objects of interest, and for the gratification of a refined taste, never for the sake of their fruit or any other product.

The earliest fossil palms date back to the Middle Cretaceous. They are common in the Upper Cretaceous of North America, where they occur as far north as Greenland, and they are found also in the Tertiaries of North America and Europe. The prominent genera are Flabellaria, Chamærops, Sabal, Phœnix, allied to the modern fan, palmetto, and date palms.

PALM, JOHANN PHILIPP (1766-1806). A bookseller of Nuremberg, who has acquired historic celebrity as a victim of Napoleonic justice in Germany. He was born in Schorndorf, Bavaria, and succeeded his father-in-law, Stein, as a bookseller in Nuremberg, the old name of the firm being retained. In the spring of 1806 a pamphlet, entitled *Deutschland in seiner tiefen Erniedrigung*, which contained some bitter truths concerning Napoleon and the conduct of the

1. ROYAL PALM

2. WINE PALM

3. SAGO PALM

French troops in Bavaria, was sent by this firm to a bookseller in Augsburg in the ordinary course of trade, and, as Palm to the last moment of his life averred, without any regard, on his part, to its contents. Napoleon's police traced it to the shop in Nuremberg, and an investigation was ordered. Palm was in Munich, but he returned to Nuremberg, and was there arrested. An extraordinary court-martial, held at Braunau, to which place he was removed, condemned him to death (August 25, 1806), no advocate being heard in his defense. General Saint-Hilaire declared that the orders of the Emperor were positive; and the sentence was executed at two o'clock on the same day on which it was pronounced. The execution of Palm served to stir up a feeling of bitter hatred among the German people against the domination of the French, and aroused the general indignation of Europe. With the murder of the Duc d'Enghien (q.v.) this was one of Napoleon's gravest blunders. Consult Schultheiss, *Johann Philipp Palm* (Nuremberg, 1860).

PALMA, päl'mä. One of the Canary Islands (q.v.).

PALMA. The capital of the island of Majorca (q.v.) and of the Spanish Province of Baleares (Map: Spain, G 3). It is situated on the southwest coast of the island, on the Gulf of Palma, which, between capes Figuera and Blanco, is 18 miles long, and sweeps 12 miles inland. The city is surrounded by orange plantations, and is walled and fortified. The houses, some of which are built of marble, are mostly in the Moorish style of architecture; a number of the streets are wide and regular. It is the see of a bishop, and has a Gothic cathedral which, from its lofty situation, dominates the whole city. It is simple but beautiful in style, with a spire which, from the delicate and airy character of its construction, is called the Angel's Tower. Besides other ecclesiastical edifices, the town has a number of fine modern commercial and other secular buildings, such as the Bank of Spain, the Exchange, a beautiful and ornate structure in Germano-Gothic, and the Governor's palace. The chief educational institutions are a seminary, a normal school, a school of fine arts, and a museum of paintings. The chief manufactures are alcohol, liquors, chocolate, starch, sugar, flour, soap, leather, and glass. In the port, a mole 500 yards in length runs out from the bastions facing the south; and on each side of it are ship-building yards. The harbor is well sheltered, and is much used as a port of call; steamers leave it regularly several times a week for Barcelona, Valencia, and Alicante. The chief exports are oil, wine, and fruit. Population, in 1887, 60,514; in 1900, 63,783.

PALMA, Jacopo, called Il Vecchio (the elder) (c.1480-1528). A Venetian painter of the High Renaissance. He was born at Serinalta, near Bergamo, about 1480, and studied principally under Giovanni Bellini, but there is a latitude in his art method that indicates the successive dominance of several artists. His earlier works call to mind the style and technique of Bellini, as may be seen in the "Tobias and the Angel" in Stuttgart. His second manner reflects the influence of Giorgione and Titian, and is characterized by rich coloring and brilliant lighting, combined with masterly breadth of treatment. Like his great contemporaries, he achieved idealism through the perfection of nature. The finest example of this period is the altar-piece of Saint Barbara in the Church of Santa Maria Formosa, Venice. The figure of the saint is one of the most beautiful and majestic female forms in Venetian art. His later works, cast in a lower key and executed with less care, constitute his third (*blonde*) manner. The "Three Sisters," Dresden, is typical of this class. Palma was a prolific painter, and at the time of his death, which occurred at Venice, August 18, 1528, no fewer than forty unfinished works remained. Among his works the following may be selected as characteristic: "Adam and Eve," Brunswick; "The Virgin Enthroned," altar-piece at Zerman, near Treviso; "Saint Peter Enthroned" and "Healing of the Widow's Son," in the Academy, Venice. To the best period are assigned "The Adoration of the Shepherds," in the Louvre; "Meeting of Jacob and Rachel," Dresden Gallery; "Saint Peter Presenting a Worshiper to the Infant Christ," Colonna Palace, Rome; "The Madonna and Child Adored by Saints;" and a number of female portraits in the Vienna Museum. Consult: Crowe and Cavalcaselle, *History of Painting in North Italy* (2d ed., London, 1871); Rosenberg, in Dohme, *Kunst und Künstler Italiens*, iii. (Leipzig, 1879); Morelli, *Italian Masters in German Galleries* (London, 1883); Locatelli, *Notizie intorno a Giacomo Palma* (Bergamo, 1890).

PALMA, Jacopo, called Il Giovane (the younger) (c.1544-1628). A Venetian painter, grandnephew of the preceding. He was born in Venice, where he passed most of his life. A pupil of Antonio Palma, a second-class Venetian painter, he received his real inspiration from the study of the works of Titian and Tintoretto, and later, during an eight years' stay in Rome, came under the influence of the great masters of the Roman Renaissance. He acquired a mastery of expression and a facility in handling beyond that possessed by the majority of his contemporaries. The great deficiency in his work is the mechanical or mannéristic method, which makes itself felt in spite of the excellences of color or line. A number of his best productions, which are historical and religious in character, are in the Ducal Palace, the Academy, and the churches of Venice, a typical example being "Saint Catharine Rescued from the Wheel," in the Church of the Frari. Other examples are in the galleries of Vienna, Madrid, Munich, Dresden, etc.

PALMA, Ricardo (1833—). A Peruvian poet and prose writer, born at Lima. He was educated at the University of San Marcos del Rimac, and as associate editor of the Lima periodical *El Diablo* (1860) he was banished for a time for his political opinions. He held a position in the Peruvian National Library, and after it was destroyed by the Chileans in 1881, Ricardo undertook its restoration with foreign help. Besides translations from the German, Portuguese, French, English, and Italian, he published in Lima *Los anales de la inquisicion de Lima* (1863) and a volume of poems, some of which had been previously printed in Paris (1865) and in Havre (1870). His *Tradiciones* (1883-87) contain many interesting historical and other legends of Peru.

PALMA, Tomas Estrada (c.1836—). First President of Cuba, born near Bayamo, where

his father owned large estates. He studied law at the University of Seville in Spain. Upon the outbreak of the ten years' war (1868-78) he joined the revolutionists, soon rose to the rank of general, and toward the end of the war was elected to the Presidency of the Cuban Republic. Soon afterwards he was captured by the Spaniards and sent to Spain, where he was kept in confinement until the end of the insurrection. Then, as his parents were dead, and his estates confiscated, he went to Honduras, where he married the daughter of the President, and became Postmaster-General. A few years later he removed to the United States and opened a school for Latin-American boys at Central Valley, Orange County, N. Y. This he maintained until 1895, when the Cubans again rebelled; whereupon he closed his school and organized in New York City the Junta to which the present Republic in great measure owes its existence. His services were remembered by his countrymen when in 1901 they were called upon to choose their first President, for after Máximo Gomez (q.v.) refused to be a candidate Palma became their almost unanimous choice. He was inaugurated on May 20, 1902, and on the same day the United States formally relinquished all claim to jurisdiction over the internal affairs of the new nation.

PALMA DI MONTECHIARO, dē mōn'tā-kyä'rō. A town in the Province of Girgenti, Sicily, near the southwest coast, 13 miles southeast of Girgenti (Map: Italy, H 10). It is comparatively modern, dating from 1637. It has a trade in almonds, dried fruits, and sulphur. Population (commune), in 1881, 11,702; in 1901, 14,330.

PALMA CHRISTI. See Castor-Oil Plant.

PALMAROLI, päl'mä-rō'lē, Pietro (1750-1828). An Italian painter, chiefly distinguished as a restorer of paintings. He invented the art of transferring frescoes from the wall to canvas. The first work which he transferred in this manner was the "Descent from the Cross," by Daniele da Volterra, in the Church of Trinità de' Monti in Rome in 1809. This transfer created great interest throughout Italy, and in 1820 he was called to Dresden, where he restored above fifty paintings, including the Sistine Madonna. He afterwards transferred and restored a number of famous paintings at Rome, including Raphael's "Sibyls" in Santa Maria della Pace.

PAL'MAS, Cape. See Cape Palmas.

PALMBLAD, pälm'bläd, Vilhelm Fredrik (1788-1852). A Swedish author, professor of history, geography, and Greek at Upsala, and editor of the great *Swedish Biographical Dictionary* (23 vols., 1835-52). While a student at Upsala (1806-10) he purchased the university printing-press, and used it for the popularization of learning. He published the literary journal *Phosphorus*, an annual *Poetic Calendar*, and a literary review. In these enterprises Atterbom and Hammarsköld were associated with Palmblad in efforts to supplant the classical by romantic literary ideals. Palmblad was an industrious writer. His *Manual of Physical and Political Geography* (5 vols., 1826-37) is the best in Swedish. His contributions to history are superseded, as are his translations of Greek dramatists and his Greek Etymology (1845). Of his novels, the best are *Familjen Falkenstrand* (1844) and *Aurora Königsmark* (1846). Of his short stories, *Amala* (1817) and *Holmen i sjön Dall* (1819) are good.

PALM CIVET. A civet (q.v.) of the genus Paradoxurus; a paradoxure, tree-cat, or toddy-cat. This group differs from the true civets in important points of skull structure, dentition, and coloration (the tail not being distinctly ringed), and in having mainly arboreal habits. All are Oriental, and ten or a dozen species are scattered over India, the Malay Peninsula and Archipelago, and Southern China. They have the slender, sharp-nosed civet form, are about the size of house-cats, and their relatively long fur is often beautifully striped and spotted. The animals spend most of their time in trees, especially palms, but often live in the thatched roofs of cottages. During the day they sleep, coiled into a ball, and they become active only in the night, when they display remarkable agility in climbing. Their food is mainly vegetable, but all eat more or less of insects, birds' eggs and fledglings, and other small creatures. Like the fox-bats, they are very fond of the palm-juice or 'toddy' collected by the natives in vessels attached to the cut spathes of various Indian palms, especially the jaggery (*Caryota urens*). They are sometimes domesticated. Consult: Jerdon, *Mammals of British India* (London, 1868); Blanford, *Fauna of British India: Mammals* (London, 1888); Lyddeker, "Cats, Civets, and Mungooses," in *Allen's Natural History* (London, 1894); Wallace, *Tropical Nature* (London, 1878).

PALMER, pä'mēr. A town, including several villages, in Hampden County, Mass., 15 miles east by north of Springfield; on the Chicopee River, and on the Central Vermont and the Boston and Albany railroads (Map: Massachusetts, C 3). It has a public library, the Young Men's Library Association, with more than 6000 volumes; and is prominent as an industrial centre, its manufactures including cotton and woolen goods, carpets, straw hats, wire, etc. The government is administered by town meetings. Population, in 1890, 6520; in 1900, 7801.

Settled in 1716, Palmer became a district in 1752 and a town in 1775. Before incorporation it was known variously as New Marlborough, Kingsfield, The Elbow Tract, and in 1741-52 as Kingston, in honor of the first settler, John King. Consult Temple, *History of the Town of Palmer, Massachusetts* (Palmer, 1889).

PALMER. See Pilgrim.

PALMER, Alice (Freeman) (1855-1902). An American educator. She was born at Colesville, N. Y., was brought up in Windsor, graduated at Michigan University in 1876, and taught in Ottawa, Ill., and East Saginaw, Mich. Elected to the chair of history in Wellesley College in 1879, after a year she became acting president, and then received a permanent appointment (1882). Under her direction the college grew, and its organization was perfected. She married George Herbert Palmer, professor of philosophy at Harvard, in 1887, and became prominent in the Woman's Educational Association of Boston. She received the appointment of non-resident dean of the women's department in the University of Chicago in 1892. She died suddenly in Paris. Consult *Report of a Memorial Service with Addresses by J. B.*

Angell, Caroline Hazard, W. J. Tucker, and C. W. Elliot (Boston, 1903).

PALMER, ANTHONY (c.1675-1749). An American colonial Governor, born probably in England. After engaging in mercantile pursuits in Barbados for some years, he emigrated to Pennsylvania in 1707, and settled in Philadelphia. From 1708 until his death he was a member of the Provincial Council of Pennsylvania, ultimately becoming its president, in which capacity, after the resignation of Lieutenant-Governor Thomas in 1747, he acted as Governor for a year and a half, taking measures for the protection of the colony against Spain and France, then at war with Great Britain, and making several important Indian treaties. He was the founder of what is now the 'Kensington District' of Philadelphia.

PALMER, ARTHUR (1841-97). An English Latinist, born in Guelph, Ontario, Canada. He was reared in Canada, studied with high honors at Trinity College, Dublin, and became fellow there in 1867, and professor of Latin in 1880. His field was Latin poetry, especially of the Augustan age, and he was famed for his brilliant Latin style and for his felicitous emendations of Plautus, the Augustan poets (save Vergil), and Aristophanes. In the first editions of Herondas (1891) and of Bacchylides (1897) he was active. He edited: Ovid's *Heroides*, with Planudes's version (1874; revised 1898), probably his greatest work; *Propertius* (1880); and Horace, *Satires* (1883; 5th ed. 1893).

PALMER, ARTHUR HUBBELL (1859—). An American Germanic scholar, born in Cleveland, Ohio, and educated at Western Reserve College. After two years' study in Europe he became professor of German at Adelbert College, and from 1886 to 1891 was librarian of the college as well. In 1891 he was called to Yale University as professor of German language and literature. He edited various German texts, among them Schiller's *Wilhelm Tell* (1898) and *Geschichte des Dreissigjährigen Krieges* (1899), and Goethe's *Hermann und Dorothea* (1902).

PALMER, BENJAMIN MORGAN (1818-1902). An American Presbyterian clergyman, born in Charleston, S. C. He was a student at the University of Georgia, and studied theology at Columbia Theological Seminary, S. C. Afterwards he was in charge of churches at Savannah (1841-43) and at Columbia (1843-46). He had the chair of Church history and polity in the Columbia Theological Seminary from 1853 until 1856, when he took charge of the First Presbyterian Church at New Orleans. He was moderator in the first General Assembly at Augusta, Ga., in 1861. He was one of the founders, in 1847, of *The Southern Presbyterian Review*.

PALMER, EDWARD HENRY (1840-82). An English Oriental scholar. He was born in Cambridge, and went into business in London. In 1863 he entered Saint John's College, Cambridge, where he graduated in 1867, and was in that year appointed fellow. In 1869 he went to Sinai on the Sinai survey expedition; and in 1870 he again made explorations in the desert of Tih, Edom, and Moab with C. F. T. Drake. In 1871 he became professor of Arabic at Cambridge. In 1881 he resigned this position and went to London, where he engaged in journalism. In 1882 he was sent on a secret service mission among the Bedouin tribes to induce them not to ally themselves with Arabi Pasha (q.v.) in his rebellion against the Khedive. He met with eminent success, but while on the mission was betrayed by a guide and shot by the rebels. Palmer was a prolific writer on Oriental topics. Among his works are the following: *Oriental Mysticism, Theosophy of the Persians* (1867); *The Desert of the Exodus* (2 vols., 1871); *The Negeb or South Arabic Language* (1874; 2d ed. 1885); *A Concise Dictionary of the Persian Language* (1876; 2d ed. 1884), *English-Persian Dictionary*, completed after his death by G. Le Strange (1883); a translation of the Koran, in the *Sacred Books of the East* (1880); several translations from and into Persian; *The Poetical Works of Beha-ed-din Zoheir of Egypt, with a Metrical English Translation, Notes and Introduction* (1876-77; the notes were never published); and a *Simplified Grammar of Hindustani, Persian, and Arabic* (1882; 2d ed. 1885). Consult his *Life* by Walter Besant (London, 1883).

PALMER, ERASTUS (1817-1904). An American sculptor. He was born at Pompey, Onondaga County, N. Y., April 2, 1817. He was a carpenter by trade, but in 1840-48 entered upon an artistic career in Albany as cameo-cutter. He then attempted sculpture, and in 1851 exhibited his first marble bust, the "Infant Ceres," at the Academy of Design, New York. His works include the bas-reliefs "Faith," "Mercy," and "Peace in Bondage;" the ideal busts "Resignation," "Spring," and "June;" portrait busts of Alexander Hamilton, Washington Irving, and of Dr. Armsby, Washington Park, Albany, N. Y.; and the statues "The Sleeping Peri," "The White Captive," and "The Angel of the Sepulchre" (Rural Cemetery, Albany, N. Y.).

PALMER, GEORGE HERBERT (1842—). An American educator and writer on classical and pedagogical subjects. He was born in Boston, graduated at Harvard in 1864, studied at Tübingen, Germany, and Andover Theological Seminary, became instructor in Greek at Harvard College in 1870, assistant professor in philosophy there in 1883, and Alford professor of natural religion, moral philosophy, and civil polity in 1889. He was twice married, first to Ellen Margaret Wellman (1871-79), next (1887) to Alice Freeman, then president of Wellesley College. His publications include *New Education, The Glory of the Imperfect, Self-Cultivation in English*, and translations of the *Odyssey* of Homer and the *Antigone* of Sophocles.

PALMER, JAMES SHEDDEN (1810-67). An American naval officer, born in New Jersey. He entered the United States Navy as midshipman in 1825, was made lieutenant in 1836, and during the Mexican War commanded the blockade-schooner *Flirt*. In 1855 he was promoted to be commander, and at the outbreak of the Civil War he was in command of the *Iroquois* of the Mediterranean squadron. He was soon recalled and attached to Admiral Dupont's blockading fleet; was made captain in 1862, led the advance in the passage of the Vicksburg batteries, and participated in the fight with the Confederate ram *Arkansas*. In 1863 he was promoted to be commodore. He became a close friend of Farragut, whose flag-captain he was at Mobile Bay and New Orleans. In 1866 he was made [illegible]

[illegible] and commanded the North Atlantic [illegible] until his death.

PALMER, John (c.1742-98). An English [illegible], born in London. He made his first appearance on the stage in 1762, but gained no great success until 1768. In 1772 he played at Liverpool, and four years afterwards reappeared at the Haymarket, where in 1777 he was the first Joseph Surface in *The School for Scandal*. Palmer built the Royalty in 1785, but never made it a success. The pamphleteering war in which he then engaged broke his spirit and health, and he died on the stage in the fourth act of Lewis's *Castle Spectre*, in which he was playing Father Philip.

PALMER, John McAuley (1817-1900). An American soldier and political leader, born at Eagle Creek, Scott County, Ky. In 1831 he removed to Illinois and in 1839 was admitted to the bar. He took an active interest in politics, and was elected by the Democrats to the State Senate in 1852, but soon afterwards became identified with the new Republican Party, was chosen a delegate to its first national convention, and in 1856 zealously supported Frémont's candidacy. On the outbreak of the Civil War he was commissioned colonel of the Fourteenth Illinois Volunteers, and on December 20, 1861, was promoted to be brigadier-general. He served with Frémont in Missouri, and with Pope at New Madrid (March 13, 1862) and Island No. 10 (April 8, 1862). The same year he was advanced to the rank of major-general and received command of a division, which he led at Murfreesboro (December 31, 1862, to January 2, 1863). At the battle of Chickamauga (September 19-20, 1863) he led one of Crittenden's divisions, and at Chattanooga commanded the Fourteenth Corps of the Army of the Cumberland. His corps formed part of Thomas's command during the Atlanta campaign, and took part in the desperate charge at Kenesaw Mountain (June 27, 1864), and in the battle at Peach Tree Creek (July 20, 1864), soon after which Palmer gave up his command. In 1868 he was elected Governor of Illinois by the Republicans, but four years later returned to the Democratic Party, and in 1876 energetically supported Samuel J. Tilden. In 1890 he was elected United States Senator, and in 1896 accepted the nomination for President from the Gold Democrats.

PALMER, John Williamson (1825-96). An American poet, born in Baltimore, Md., April 4, 1825. He studied medicine, was city physician in 1849, went to China in 1851, volunteered in the East India Company's service, and was surgeon on a war steamer in the Burmese campaigns (1852-53). He was war correspondent for the New York *Tribune*. In 1853 he returned to the United States and wrote for various publications till his death. He wrote novels and books of travel, e.g. *The New and the Old, or California and India in Romantic Aspects* (1859), and many poems, which have been collected (1901). He is best known for his stirring ballad *Stonewall Jackson's Way*, written September 17, 1862, while the battle of Antietam was in progress. He was also an editorial assistant on the *International*, the *Century*, and the *Standard* dictionaries.

PALMER, Nathaniel Brown (1799-1877). An American sea-captain, the discoverer of the Palmer Archipelago. He was born at Stonington, Conn., and was educated at a private school. He went to sea at the age of fourteen, and in 1821, in command of the sloop *Hero*, a vessel of only 40 tons, set out from Yankee Harbor in the South Shetlands to investigate a new land that had been sighted to the southward. On his return from this land he met the Russian exploring expedition under Bellinghausen. The region that he discovered was for more than half a century held to be a portion of that spur of the alleged Antarctic continent which lies below South America; but more recent investigations have shown that it is merely a part of the archipelago lying above what is supposed to be the continental mass. Palmer was subsequently in command of various clipper ships and was himself a designer of clippers, among them the *Hoqua* and the *Oriental*. In 1849 he retired from the sea. He became a director of the Fall River line of steamers and was mainly instrumental in building the *Bristol* and the *Providence*.

PALMER, Ray (1808-87). An American clergyman and hymn-writer. He was born at Little Compton, R. I., studied at Phillips Academy, Andover, Mass., and graduated from Yale College in 1830. After graduation he taught in a private school in New York City, and later became associated with Prof. E. A. Andrews in conducting a young ladies' institute at New Haven, Conn. Becoming a licentiate in 1832, he was called to the pastorate of the Central Congregational Church, Bath, Maine, in 1835, where he remained until 1850, when he resigned to accept a call from the First Congregational Church, Albany, N. Y. In 1866 he relinquished pastoral work and became secretary of the American Congregational Union at New York. The years previous to his death were spent at Newark, N. J. He is chiefly remembered as a writer of hymns, one of which—"My faith looks up to Thee"—exists in twenty different languages. His collections of hymns are: *Hymns and Sacred Pieces* (1865); *Hymns of My Holy Hours* (1868); and *Voices of Hope and Gladness* (1880).

PALMER, Roundell, first Earl of Selborne (1812-95). An English politician and judge. He graduated in 1834 from Oxford after a brilliant career there, and received his master's degree in 1836. In the following year he was admitted to the bar, and soon became noted for his keen and subtle mind and his vast learning. In 1847 he entered Parliament for Plymouth and joined the adherents of Peel. After a varied Parliamentary career, losing his seat on two occasions, he became Solicitor-General in Palmerston's Cabinet in 1861, and in 1863 Attorney-General, which post he held until 1866. Palmer gave an independent support to Gladstone, and in 1872 became Lord Chancellor, and was raised to the peerage as Baron Selborne of Selborne. As Chancellor, Selborne had much to do with the reformation of the judiciary. In 1874 he was displaced, but again became Chancellor in 1880, and in 1882 was created Viscount Wolmer of Blackmoor and Earl of Selborne. He was opposed to home rule for Ireland, and became a Liberal-Unionist. Selborne also wrote several works on hymns, and held at different times posts of honor in the universities, receiving also various honorary degrees.

PALMER, Samuel (1805-81). An English landscape painter, illustrator, and etcher. He was born at Newington, January 27, 1805. He first studied under an obscure artist named Wate, and then in the antique school of the British Museum; but his style was formed under the influence and advice of his father-in-law, John Grinnell, and William Blake. After sketching extensively in Wales and Devonshire, he went to Rome in 1837, remaining there two years. From this time he devoted himself mainly to water colors, becoming a full member of the Water Color Society in 1854. He also illustrated a number of works, the best of which were Milton's *Comus*, *L'Allegro*, and *Il Penseroso*. Palmer was the last of the ideal school of landscape painters, represented in England by Wilson, Turner, and others. His paintings, mostly aquarelles, are good in color and chiefly characterized by wealth of poetic feeling. Among the best are: "Dream on the Apennines" (1864); "Curfew" (1870); "The Waters Murmuring" (1877); "The Eastern Gate" (1881); "The Bellman" (1882); and the "Street of the Tombs, Pompeii" (1870), an oil painting. As an etcher he is placed in the first rank by Ruskin and Hamerton; he became a member of the Etchers' Club in 1853. His best plates include: "The Sleeping Shepherd," "The Skylark," and "The Rising Moon" (1857); "The Herdsman" (1865); "Morning of Life" (1872); "The Lonely Tower" (1880). Like his water colors, his etchings are highly finished and are marked by a subtle treatment of light. His literary proclivities are shown by his translation of Vergil's *Eclogues*, which he began to illustrate, but completed only one etching, "The Opening of the Fold," before his death, which occurred near Reigate, May 24, 1881. Consult: A. H. Palmer, *Samuel Palmer, Painter and Etcher* (London, 1891); Varley, *Samuel Palmer, Memoir* (ib., 1882).

PALMER, Walter Launt (1854—). An American landscape painter. He was born at Albany, N. Y. He was a pupil of F. S. Church at Hudson, N. Y., in 1870-72, and of Carolus Duran in Paris. He became noted for his landscapes, especially winter scenes with snow effects, but also painted Venetian scenes. His chief works include: "Venice" (1882), in private possession, Lynn, Mass.; "January" (1887); "Autumn Morning" (1892); "Panorama of Venice," "Domes of La Salute," "End of a Winter Day," and "Under the Pines" (1896); "The Open Door" (1901). He received the second Hallgarten prize at New York in 1887, a gold medal at the World's Columbian Exhibition in 1893, and honorable mention at Paris in 1900. He is a member of the National Academy, the Society of American Artists, and the American Water-Color Society.

PALMERÍN DE OLIVA, päl'mâ-rēn' dā ō-lē'vä (Sp., Palmer of the Olive Tree). The first of a series of chivalrous romances written in the Spanish Peninsula in imitation of the earliest and most famous work of the kind, the *Amadis*, and likewise of great importance in the development of the modern novel. The *Palmerin de Oliva* is attributed to Francisco Vázquez, and seems to belong to about 1511. The series of *Palmerines* ended with the *Palmerin de Inglaterra* (c.1544) of the Portuguese Francisco de Moraes. Consult the English translations of this latter romance by Anthony Munday, begun in 1589 and completed in 1595, and by Southey (1807). The earliest French *Palmerin* appeared at Lyons in 1553.

PALMERSTON, päm'ẽr-stun, Henry John Temple, third Viscount (1784-1865). A celebrated English statesman. He was born in Hampshire, October 20, 1784, a descendant of an old and historic family. Receiving his early education at home under an Italian refugee and at Harrow, Palmerston studied later in the University of Edinburgh, under Dugald Stewart, in whose family he lived, and at Saint John's College, Cambridge, where he received his master's degree in 1806. He succeeded his father in the Irish peerage in 1802. His eminent abilities were early recognized; the Tory Party in the university selected him in 1806 as their candidate to succeed Pitt. Twice unsuccessful, he entered Parliament for Newtown, which seat he held till 1811, when he was chosen at Cambridge and represented his *alma mater* for twenty years, losing his seat only when he entered the Grey Ministry and supported the Reform Bill. After a term for Bletchingley, and one for South Hampshire, he found a seat at Tiverton, in 1835, which he held till his death. In 1809 he accepted the office of Secretary at War in the Duke of Portland's Administration. This office he held during the governments of Perceval, Liverpool, Canning, Goderich, and Wellington—a period extending from 1809 to 1828. There was ample scope at the War Office for Palmerston's administrative talents and activity. The military system swarmed with abuses, and the labor thrown upon the Secretary at War during the Peninsular campaign was prodigious. Palmerston early attached himself to the Canning section of the Liverpool Administration, and accepted a seat in the Cabinet of Canning. His official connection with the Tory Party ceased in 1828, when Wellington insisted on accepting Huskisson's resignation, which was followed by Palmerston's retirement. The Duke's Government was swept away in the reform flood of 1830, and Earl Grey, who became Prime Minister, offered the seals of the Foreign Office to Palmerston. The European horizon was so disturbed at this crisis that war seemed inevitable, but Palmerston brought about friendly relations with the new King of France, Louis Philippe, and the two countries thus acting in reasonable harmony, the independence of Belgium was effected, and constitutional governments were established in Spain under Queen Isabella, and in Portugal under Queen Maria. In addition to the above questions Palmerston had to deal with Eastern problems. He supported Turkey against Russian aggression. Later (1840) he united with Russia against France to curb the rising power of Mehemet Ali, apparently fearing that French influence in Egypt might endanger England's communication with India. The Opium War of 1840-42 resulted in the opening of five Chinese ports to trade. In 1841 the Quintuple Treaty to suppress the African slave trade was negotiated, but failed, being opposed by Lewis Cass, United States Minister to France, on account of the right of visitation clause. A strong foreign policy gave Palmerston during these years greater reputation abroad than in England. At home he favored free trade, labor laws, shorter hours, and factory acts.

In 1841 Palmerston went out of office with

the Whigs on the question of corn duties; but on their return in 1846 he resumed the seals of the Foreign Office. His second foreign administration furnished various subjects of hostile party criticism. A vote of censure on the foreign policy of the Government was carried in 1850 in the House of Lords on the motion of Lord Stanley (afterwards Earl of Derby). A counter-resolution, approving the foreign policy of the Government, was thereupon moved in the House of Commons. The debate lasted four nights. In December, 1851, however, Palmerston was dismissed from the Russell Cabinet. He had in an unofficial oral way expressed his approbation of the coup d'état of Louis Napoleon, without consulting either the Premier or the Queen; and, as explanations were refused, her Majesty exercised her right of dismissing her Minister. A few weeks later Palmerston avenged himself by bringing about the fall of the Russell Administration on a comparatively trifling question regarding the militia. He refused an offer from the Earl of Derby to join the Government which that statesman was commissioned to form, but accepted the post of Home Secretary in the coalition Administration of the Earl of Aberdeen in 1852. The fall of this Government, on account of the mismanagement in the Crimean War, placed Palmerston in the position of Prime Minister, to which he was unanimously called by the voice of the nation (February, 1855). He vigorously prosecuted the Russian war until Sebastopol was taken and peace was made. His Government was defeated in March, 1857, on Cobden's motion condemnatory of the Chinese war. Parliament was dissolved, and Palmerston met the House of Commons with a large majority. But his Administration fell in February, 1858, on account of the Conspiracy Bill, intended to protect foreign rulers against the machinations of plotting refugees. A short Conservative administration followed; but in June, 1859, Palmerston was again called to the post of First Lord of the Treasury and Premier, which he continued to fill up to his death. His sympathies were always with oppressed nationalities, so he favored Italian unity, and opposed the war of Prussia and Austria against Denmark in 1864. It was his ambition to be considered the minister of a nation rather than the minister of a political party; and his opponents were constrained to admit that he held office with more general acceptance than any English minister since the time of Chatham. As an orator, he was usually homely and unpretending, but always sensible and practical. He was a dexterous tactician, and a ready, witty, and often brilliant debater. He was popular as a minister, because he was thoroughly English in his ends and aims. He died without issue October 18, 1865. Lord Dalling (Sir Henry Bulwer) prepared the *Life of Palmerston to 1847*, in three volumes; this work was completed by Sir Evelyn Ashley in two additional volumes (London, 1870-76). Consult also: Ashley, *Life and Correspondence of Henry John Temple, Viscount Palmerston* (London, 1878); Sanders, *Life of Viscount Palmerston* (ib., 1888); Lorn, *Biography of Lord Palmerston* (New York, 1891); Francis, *Opinions and Policy of Viscount Palmerston* (London, 1852).

PALMETTE. A conventional ornament, so called because of its resemblance to a palm-leaf, of which it is a conventionalized form. It was very generally used in Greek art, either carved or painted, upon friezes, columns, vases, cloths, etc. Since the Renaissance it has been frequently applied in modern decoration.

PALMET'TO (from Sp. *palmito*, diminutive of *palma*, palm), *Sabal Palmetto*. A species of palm, a native of maritime parts of North America, from Florida to North Carolina, found farther north than any other American species of palm. It attains a height of 40 to 50 feet, and has a crown of large palmate leaves, the blade from one foot to five feet in length and breadth, and the footstalk long. The flowers are small, greenish, and in long racemes; the fruit black, about as long as a pea-pod, and inedible. The leaves are made into hats, mats, etc., and are also largely used for thatch. The terminal bud or cabbage is eaten. The wood is extremely porous, but is preferred to every other kind of wood in North America for wharves, as it is very durable, and not liable to be attacked by the teredo. A second American species, the saw palmetto (*Serenoa serrulata*), occurs from South Carolina to Florida. It has a short stem and numerous clustered fan-shaped leaves, while its berries have certain medicinal properties. A still smaller species is the dwarf palmetto (*Sabal Adansonii*), a stemless species which bears a cluster of leaves a foot or two long. (See CABBAGE PALM.) The *Chamærops humilis* of the south of Europe is also called palmetto, and the name is applied to other species.

PALMETTO STATE. South Carolina. See STATES, POPULAR NAMES OF.

PALMI, päl'mē. A town in the Province of Calabria, Italy, situated on the southwest coast, 21 miles northeast of Reggio by rail (Map: Italy, K 9). Near by rises Mount Elia, commanding a magnificent view, and surrounded by vineyards, and orange and olive groves. The harbor affords good fishing. Population (commune), in 1881, 11,082; in 1901, 13,297.

PALMIERI, päl'mē-ā'rē, LUIGI (1807-96). An Italian physicist, born in Faicchio. He was appointed professor of physics at the University of Naples in 1847, and in 1854 became director of the meteorological and seismological observatory on the slope of Mount Vesuvius, whose eruptions and other phenomena he studied most carefully. He published a series of annals of this observatory (1869-73) and various studies in electricity, seismology, and volcanology. He was the inventor of a seismograph, an electrometer for the study of atmospheric electricity, and other meteorological instruments.

PALMIRA, päl-mē'rä. A town of the Province of Santa Clara, Cuba, 8 miles north of Cienfuegos, on the Cienfuegos-Santa Clara Railway. Palmira lies in the midst of a district producing largely sugar, corn, and tobacco. Its population, in 1899, was 4519.

PALMIRA, päl-mē'rä. The capital town of the province of the same name, in the Department of Cauca, Colombia, 160 miles southwest of Bogotá, and 7 miles from the right bank of the Cauca. It is situated on a spacious plain called Llanos de Malagana, famous as a rich agricultural district, and especially for the cultivation of a fine grade of tobacco. Stock-raising is also an important industry. It is a modern town,

OLD FAN PALMS (Washingtonia Filifera) AT PASADENA, CALIFORNIA

SABAL PALMETTO, FLORIDA

and now ranks as the second in the department, with a population of about 12,500.

PALMISTRY. See CHIROMANCY.

PALMITIC ACID, $C_{16}H_{32}O_2$. One of the most important of the fatty acids. In a pure state, when crystallized from alcohol, it occurs in the form of beautifully white acicular crystals arranged in tuft-like groups. These crystals are devoid of odor or taste, communicate a fatty feeling to the finger, melt at 62° C., and solidify on cooling in the form of crystalline scales. The acid is lighter than water, in which it is insoluble; but it dissolves freely in boiling alcohol and in ether, and the solutions have a distinctly acid reaction. In small quantities it may be distilled without decomposing, if the heat be carefully regulated; and it may be distilled in any quantity under reduced pressure. The neutral palmitates of the alkalies constitute soaps, and are soluble in warm water; if, however, their solutions are largely diluted with cold water, they are decomposed, an insoluble acid salt being precipitated, while a half of the alkali remains in solution. The other most important compounds of palmitic acid are those which it forms with glycerin and with cetyl alcohol. With glycerin this acid forms three compounds, the most important of which is palmitin (q.v.). In combination with cetyl alcohol, whose composition is represented by the formula $C_{16}H_{33}OH$, it is the main constituent of spermaceti (q.v.), and as palmitate of melissyl it occurs in beeswax. The calcium salt of palmitic acid is found in adipocere, its sodium salt in blood and in serous fluids. Palmitic acid was first obtained from palm oil—hence its name. It may be obtained from oleic acid by fusing with caustic potash (see OLEIC ACID), but is now usually prepared either from Japan wax or myrtle wax.

PAL'MITIN, or TRI-PALMITIN. A white fat, usually occurring, when crystallized from ether, in the form of a mass of small scaly crystals, insoluble in water, but readily soluble in ether and in boiling alcohol. It is a constituent of almost every kind of fat, and is the preponderating ingredient in those of a semi-solid consistence, and in many oils. It receives its name from the abundance in which it occurs in palm oil, from which it may be readily obtained, and then purified by recrystallization from ether. The true melting-point of the pure substance is 61° C. (See STEARIN.) Chemically it is a compound formed by the union of one molecule of glycerin with three molecules of palmitic acid, three molecules of water being set free, according to the following equation:

$$\underset{\text{Glycerin}}{C_3H_5(OH)_3} + 3\underset{\text{Palmitic acid}}{C_{15}H_{31}CO_2H} = \underset{\text{Palmitin}}{C_3H_5(OC_{15}H_{31}CO)_3} + \underset{\text{Water}}{3H_2O}.$$

It is saponified, or broken up into its constituents with formation of soap, by boiling with the caustic alkalies.

PALM OIL. An oil obtained from the fruit of several species of palm. When fresh it is of an orange tint, sweetish taste, and violet-like odor. It is of the consistency of butter, for which it is sometimes used, and, like butter, it easily becomes rancid. It is prepared by boiling the fruit in water. It is used in candle and soap making, and, on account of its pleasant odor, as a scent to toilet preparations.

PALM SUNDAY (Lat. *Dominica Palmarum*). The last Sunday of Lent, so called from the custom of blessing branches of the palm tree, or of other trees substituted in those countries in which palm cannot be procured, and of carrying the blessed branches in procession, in commemoration of the triumphal entry of Christ into Jerusalem (John xii.). The date of the origin of this custom is uncertain. Some special celebration of the day is described as early as 386, but the ceremony of blessing the branches can hardly be referred to an earlier date than the ninth, or possibly the eighth century. A procession is formed, the members of which issue from the church carrying branches in their hands, and singing the hymn of Venantius Fortunatus, "*Gloria, laus, et honor.*" In the Greek Church the book of the Gospels is borne in front. In some countries a priest, or occasionally a lay figure, was led at the head, mounted upon an ass, a usage which still exists in Spain and in Spanish America. Before their return to the church the doors have been closed, and certain strophes of the hymn are sung alternately by a choir within the church and by the procession without, when, on the sub-deacon's knocking at the door with the shaft of the processional cross, it is again thrown open, and the procession re-enters. During the singing of the passion in the solemn mass, which ensues, the congregation hold the palm branch in their hands, and at the conclusion of the service it is carried home to their respective houses, where it is preserved during the year. The ashes employed in the service of Ash Wednesday are made by burning the palms of the preceding year.

PALM-SWIFT. A bird. See SWIFT.

PALM-WEEVIL. See GRU-GRU.

PALMY'RA (Lat., from Gk. Παλμυρά, translation of Heb. *Tadmōr*, Tadmor, from *tāmār*, palm-tree). The Greek Tadmor, connected by tradition with a city built by King Solomon (I. Kings ix. 18; II. Chron. viii. 4), an ancient city in an oasis of the Syrian desert, 150 miles northeast of Damascus (Map: Turkey in Asia, G 5). It owed its importance to two springs of water which produced luxurious vegetation. Being halfway between the Orontes and the Euphrates, it became, at an early date, a caravan station for the trade between the Mediterranean and the Tigris-Euphrates Valley. Its population was, therefore, always hybrid, though in the main Aramean. The city is first mentioned in B.C. 41 in connection with the wars of Antonius against the Parthians, when the Triumvir made an unsuccessful attempt to possess himself of its riches. At an early time it was reckoned as belonging to the Roman Empire, though retaining a large measure of independence. No Roman troops were stationed here, and Palmyra had to patrol the district between Damascus and the Euphrates with her own troops. In the wars of Trajan the city was almost destroyed, but was rebuilt by Hadrian (130) and called Hadrianopolis or Hadriana Palmyra. It was made a Roman colony under Caracalla (212), receiving the *Jus Italicum*. In the course of time a semi-independent monarchy was developed here. Originally it was governed by a senate, at the head of which was a senator. The first senator of whom we have mention was Hairan, son of Wahballat (222-235), who took the name of Septimius.

He was followed by his son Udainath (Odenathus), who in turn was followed by his son Hairan (Septimius Hairanes, died 255). He was followed by his brother Udainath II., who, though still called *Vir Consularis*, was made King of Palmyra and Viceroy of the Emperor for the East. After his death he received the high-sounding title of 'King of Kings' (inscription of the year 271). The city itself was governed by another Palmyrene, Septimius Varodes, as procurator. Udainath took the part of Rome in her war against the Persian King Sapor; relieved Edessa, recovered Nisibis and Carrhæ (264), marched against Ctesiphon, drove out the Persians, expelled the Goths from Cappadocia, and marched into Emesa (266). He seems to have had Armenia, Cilicia, Cappadocia, Syria, and Arabia in his power. He was killed in the year 267. His son Wahballat (Athenodorus) was too young to rule, and the Prince's mother, Zenobia (in Palmyrene Bat-Zabbai), wielded the sceptre in his stead. She bore the title 'Queen of Palmyra and the East,' and she tried to free herself from Roman tutelage. Under her rule the Palmyrene realm reached its greatest extension. Her adviser and instructor in Greek was the Platonic philosopher Longinus. She defeated the Roman army under Heraclianus, and attempted to add Egypt to her dominions, sending thither Zabdas with an army of 70,000 men. Though he occupied Alexandria for a time, he was driven out of Egypt (270) by Probus, the general of Aurelian. The Emperor himself marched against her in 272, and being only weakly supported by the Parthian Varahran, she was defeated in Syria, and Palmyra was besieged. Zenobia escaped to the Euphrates, but was captured and graced the triumph of the conqueror in 274. While Aurelian was on his way home the Palmyrenes rose, appointed a certain Antiochus their ruler, and massacred the Roman garrison. Aurelian turned back and destroyed the city (273), taking the most beautiful spoils of the Temple to Rome. The city now lost its chief importance as a trade centre, the caravans being sent via Bosra and Ctesiphon. An attempt was made by Diocletian (284-305) to rebuild the city. It was the seat of the first Illyrian regiment, and later became also the seat of a Christian bishopric. Justinian rebuilt the churches and the public buildings and placed a garrison there. The city, however, continued to decline. It was taken by the Arabs under Khalid in 634, destroyed again in 744, severely injured by an earthquake in 1157, and plundered by the Tatars under Tamerlane in 1401. Toward the end of the sixteenth century the Druse chieftain Man Oghlu fortified it; but the fortifications were destroyed by the Turks in the seventeenth century. Since then the place has been occupied by the Aneze Bedouins. The modern city is a miserable conglomeration of Bedouin huts, containing about 1500 souls.

Palmyra was an Aramean city, thickly overlaid with Greek culture. Its municipality was patterned after those of the other Greek cities in the Roman Empire. Its officials had Greek titles. With the district around it, it formed a separate tariff union, the customs being collected by the community itself. The tariff of duties, engraved on stone, found in 1882, is in Palmyrene and Greek. The caravans formed regular associations, the leaders of which were the prominent and influential men of the place. There were also guilds of goldsmiths and silversmiths. Remains of a Jewish synagogue were found there by Euting in 1883, and Mitwoch in 1899. The ruins of Palmyra were discovered by Huntington in 1678 and were visited by Wood and Dawkins in 1751. Since then many travelers have described these ruins and have given an idea of the beauty and stateliness of this city in the desert at the time of its grandeur. The great temple of Baal had a colonnade of 390 columns of the Corinthian order, and was surrounded by walls 50 feet high. There must have been numerous other shrines, as the Palmyrene pantheon was quite extensive. The walls of Justinian still remain, as well as the ruins of the aqueduct and many beautifully carved commemorative towers. The Palmyrene language belonged to the western branch of the Aramaic family. The script is a development of the Aramaic branch of Semitic writing and is the direct parent of the square Hebrew. A large number of grave inscriptions have been found, not only in Palmyra itself, but also in Rome, Africa, and Britain, the latter set up by soldiers of Roman legions at one time quartered in Palmyra. Most of the grave inscriptions are accompanied by reliefs of the dead persons, most beautifully executed. The inscriptions are often bilingual and two have been found in Dacia only in Latin. Other inscriptions have been found engraved upon clay medallions, which evidently served as talismans. Consult: Mommsen, *Römische Geschichte*, vol. v., ch. ix. (3d ed., Berlin, 1886); Von Oppenheim, *Vom Mittelmeer zum Persischen Golf*, vol. i., ch. viii. (Berlin, 1899); Wright, *An Account of Palmyra and Zenobia* (New York, 1895); Abamelek-Lasarew, *Archäologische Untersuchungen* (Saint Petersburg, 1885); De Vogüé, *Inscriptions semitiques* (Paris, 1869); Sallet, *Die Fürsten von Palmyra* (Berlin, 1866); Moritz, *Zur antiken Topographie der Palmyrene* (Berlin, 1889).

PALMYRA. A city and the county-seat of Marion County, Mo., 16 miles southwest of Quincy, Ill., on branches of the Chicago, Burlington and Quincy Railroad (Map: Missouri, E 2). It has Centenary Academy, a fine courthouse, fair grounds, and a 'Big Spring.' The industries are represented by flour and grist mills, a creamery, a pickle factory, and a carriage and wagon factory. Settled in 1818, Palmyra was laid out in the following year, and incorporated in 1855. Population, in 1890, 2515; in 1900, 2323.

PALMYRA PALM (named from the city of Palmyra in Syria), *Borassus flabellifer*. A species of palm with a magnificent crown of fan-shaped leaves. It occurs throughout India and the Archipelago, and in tropical West Africa. The stem attains a height of 20 to 100 feet, and tapers slightly upward. The leaves are about 4 feet long, with spiny-edged stalks of about the same length, each leaf having 70-80 rays. The fruit is somewhat triangular, about the size of a child's head, having a thick, fibrous, and rather succulent yellowish-brown or glossy black rind, and containing three seeds each as large as a goose's egg. The Palmyra palm is the most common palm of India, growing spontaneously in many districts, cultivated in others, and reaching as far north at latitude 30°. It is one of the most valuable palms known, more

than 800 uses having been enumerated for its different parts. It is of slow growth, and the wood near the circumference of the stem in old trees is very hard, black, heavy, durable, susceptible to a high polish, and valuable, easily divided in a longitudinal direction, but very difficult to cut across. The Palmyra palm abounds greatly in the north of Ceylon, forming extensive forests; and the timber is exported to the opposite coast of India, being of superior quality to that which is produced there. It is much used in house-building. The stalks of the leaves are used for making fences, etc. The leaves are used for thatching houses; for making baskets, mats, hats, umbrellas, and large fans; and for writing upon. Their fibres are employed for making twine and small rope. A fine down found at the base of the leaf-stalks is used for straining liquids and for stanching wounds. The Palmyra palm yields palm wine, arrack, and sugar (*jaggery*) of India. (See ARRACK.) The fruit is cooked in a great variety of ways, and used for food. The seeds are jelly-like, and palatable when young. A bland fixed oil is extracted from the fruit. The young plants, when a few inches high, are esteemed as a culinary vegetable, being boiled and eaten generally with a little of the kernel of the cocoanut; and sometimes they are dried and pounded into a kind of meal. Multitudes of the inhabitants of the north of Ceylon depend almost entirely on the Palmyra palm to supply their wants. In the 'Palmyra regions' of the southern Deccan vast numbers of the people subsist chiefly on the fruit of this palm.

The Deleb palm, so important to the inhabitants of Central Africa, formerly considered as a distinct species, is now believed to be the same as the Palmyra palm.

PALMYRA WOOD. Properly this name applies only to the wood of the Palmyra palm (*Borassus flabellifer*), but it is generally used for all kinds of palm-tree wood upon the market, of which very much is the wood of the cocoanut palm (*Cocos nucifera*) and the allied species *Cocos plumosa*. These woods are also called speckled wood and porcupine wood by the dealers, the former name being applied to those veneers cut transversely, and showing the ends of numerous black fibres mixed with the lighter colored portions, and the latter to longitudinal sections, in which the mixed black and white fibres much resemble porcupines' quills.

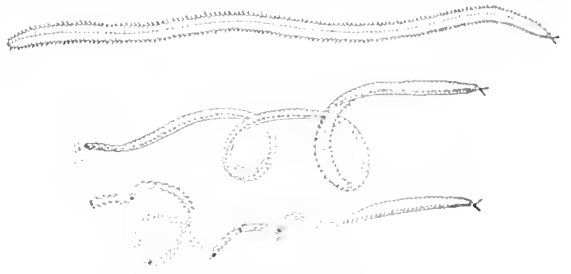
PALO, pä'lō. A town of Leyte, Philippines, situated on the northeast coast, six miles south of Tacloban (Map: Philippine Islands, K 8). Population, 17,736.

PALO ALTO, pä'lō ăl'tō. A town in Santa Clara County, Cal., 33 miles southeast of San Francisco, on the Coast Division of the Southern Pacific Railroad (Map: California, B 3). It has a beautiful location and healthful climate, and is the seat of Leland Stanford Junior University (q.v.), and of a large Roman Catholic theological seminary. There are municipal water-works and a municipal electric-light plant. Palo Alto was settled in 1890-91, and was incorporated in 1894. Population, in 1900, 1658.

PALO ALTO. A place in southern Texas, 8 miles northeast of Brownsville (q.v.), where on May 8, 1846, the first important battle in the war between Mexico and the United States was fought. 2300 Americans under General Taylor defeating about 6000 Mexicans under General Arista. It was essentially an artillery battle, though the Mexicans made a futile cavalry charge late in the day. Early on the following day General Arista retreated, and took up a strong position at Resaca de la Palma (q.v.), where he was again defeated. The Americans lost at Palo Alto 7 killed, 47 wounded; the Mexican loss was 252. After the battle Arista retreated to Resaca de la Palma. Consult: Bancroft, *History of Mexico*, vol. v. (San Francisco, 1885); and Howard, *General Taylor* (New York, 1892), in the "Great Commanders Series." See MEXICAN WAR.

PALO DEL COLLE, del kōl'lā. A town in the Province of Bari delle Puglie, Italy, 12 miles southwest of Bari. It is in a fruit-growing region, and carries on a trade in wine and cattle. Population (commune), in 1881, 10,278; in 1901, 12,851.

PALOLO (pa-lō'lō) **WORM** (Samoan name, Fijian *mbulolo* or *bololo*). One of the annelid worms (*Eunice viridis*) allied to Nereis, which on a certain night in November appears in immense numbers at the surface of the shores of the Samoan and Fiji islands. It is then collected as food by the natives and considered a great delicacy. In this worm the sexual or hinder part of the body (epitoke), when the eggs or sperm are ripe, separates from the rest of the body and swims to the surface, where the reproductive elements are discharged, after which the worm collapses and dies. The swarming of this singular worm has been observed by A. Agassiz, at Bololo Point, Fiji Islands. On his arrival, before daylight, his guide fished up a few of the worms, and soon the water was full of them, both males and females, and men and women were catching them in all kinds of utensils. Their activity was wonderful, and the bursting of the animal when reproduction was over was most peculiar.



1. Palolo worm, the anterior end of the body at the right; 2, the same discharging the sexual products in the water from broken front end of body; 3, the same breaking into pieces and discharging the sexual products from the rents. (After Mayer.)

The Atlantic palolo worm (*Eunice fucata*) is abundant at the dry Tortugas, Fla., near Porto Rico, and probably it will be found to be widely distributed. The animal commonly lies coiled upon itself within its burrow, and very often another worm (*Polynoë granulata*) is found sharing the same burrow. The worm does not

liv[illegible] in new and compact coral rock, or in coquina of recent formation, but abounds in that which is disintegrating and has become infested with [illegible]das shells, other worms, crustaceans, etc. The burrow of the palolo always opens outward at the surface of the rock, although as far as is known the worm never leaves its burrow permanently until the time of the breeding-swarm. The Atlantic palolo swarms within three days of the time of the moon's last quarter, between June 29th and July 28th. When the swarm occurs the hinder end of the worm crawls out backward from the burrow, and attempts to swim away from the anterior, non-sexual part, which remains within the burrow. A constriction appears, allowing the sexual portion to break away from the anterior part of the worm; and immediately the posterior end darts upward to the surface, upon reaching which it continues to swim hind end foremost very near to the surface of the ocean. The worms move in all directions and begin to discharge sperm or eggs through their genital outlets (nephropores), but the least stimulus, such as being lifted from the water, or the current from the stroke of an oar, will cause them to contract violently, often breaking themselves into fragments and casting the sexual products out through rents in the skin. This normally occurs as soon as the first rays of the sun fall upon the water, and in a few minutes after sunrise all the worms will have completely freed themselves of genital products, so that the ocean becomes milky with the vast quantity of sperm and eggs. Two or three hours after sunrise no worms remain to be seen. In a dense swarm there may be on an average about one worm per square foot over wide areas of the sea, commonest where the water is about six fathoms in depth. Great numbers of the worms are devoured by fishes as they sink, although they are not attacked to any great extent while on the surface. When set free the sexual ends swim vertically upward with such rapidity that they run little risk of capture, and this habit must be a great advantage to the worm. If the swimming worm be broken into fragments each piece continues to swim backward in a normal manner, showing that the reaction is not controlled by any one ganglion, or localized group of ganglia, but that the whole sexual end of the worm is affected by the stimulus which causes the breeding-swarm.

PALOMINO DE CASTRO Y VELASCO, päl'ō-mē'nō dā kä'strō ē vā-lä'skō, Acisclo Antonio (1653-1726). A Spanish painter and author, born at Bujalance. He studied under Valdés Leal and Alfaro at Cordova. Afterwards he was associated with Claudio Coello at Madrid, and became Court painter in 1688. He executed a number of large frescoes at Valencia, Salamanca, Granada, and Madrid, which are clearly designed. He wrote *El museo pictorico y escala optica* (1715-24), which contains a history of art and a biographical dictionary from Antonio del Rincon to his own time. It furnished much of the material for the later work of Ceán-Bermudez.

PALOS, päl'ōs, or Palos de la Frontera. A small town on the southwest coast of Spain in the Province of Huelva, near the mouth of the Rio Tinto (Map: Spain, B 4). It was formerly an important port, and from here Columbus set sail with his three caravels on August 3, 1492, on the voyage which resulted in the discovery of America. Population, in 1900, 1619.

PALPITATION (Lat. *palpitatio*, from *palpitare*, to throb, frequentative of *palpare*, to feel, move quickly). The term used to signify inordinately forcible pulsations of the heart, so as to make themselves felt, and frequently to give rise to a most troublesome and disagreeable sensation. It may be either functional or a symptom of organic disease of the heart. Although it may be persistent, it far more frequently comes on in paroxysms, which usually terminate within half an hour, recurring afterwards quite irregularly, sometimes daily or several times a day, and sometimes not till after a long interval. The attack often comes on under some mental or physical excitement, but sometimes when the patient is quite composed, or even asleep. If the paroxysm is a severe one, the heart feels as if bounding upward into the throat; and there is a sensation of oppression over the cardiac region, with hurried or even difficult respiration, and even nausea. In milder attacks there is simply a consciousness of sinking or fluttering of the heart.

Palpitation is due to many different causes. It is more common in women than in men, and is apt to occur especially at puberty, the menstrual periods, and the menopause. An anæmic condition of the blood is a frequent cause. Palpitation is present in unstable states of the nervous system, such as occur in neurasthenia, hysteria, worry, anxiety, and excitement. The excessive use of tea, coffee, alcohol, and tobacco predisposes to cardiac irregularities. Perhaps the most frequent cause is a flatulent and distended stomach, acting both reflexly and directly. Palpitation is a symptom of exophthalmic goitre, and lastly it is a concomitant of organic disease of the heart itself. Either hypertrophy or degeneration of the cardiac muscle may produce it as well as affections of the valves.

The treatment of palpitation naturally depends on the causation. When the stomach is at fault, dietetic errors will need to be corrected. Tea, coffee, alcohol, and tobacco should be interdicted, since they not only affect the nerves, but hurt the digestion. Anæmia calls for iron, and neurotic conditions for sedatives such as the bromides, valerian, and camphor. When the cardiac muscle is diseased and palpitation is an expression of weakened power, digitalis, strychnine, and other cardiac stimulants must be given. During the paroxysms, relief may be had from the diffusible stimulants, as ammonia, in the form of the aromatic spirit.

PALSGRAVE, päl'grāv, John (c.1480-1554). An English grammarian, chaplain to Henry VIII. He was born in London, studied at Corpus Christi, Cambridge, and at the University of Paris, and taught French to Henry's sister, the Princess Mary, whom he accompanied to Paris on her marriage to Louis XII. Thanks to her favor, he was rapidly advanced in ecclesiastical honors. About 1517, as we know from the testimony of Sir Thomas More and of Erasmus, Palsgrave studied at Louvain, and, eight years after, he was appointed tutor to the Duke of Richmond, a natural son of Henry VIII. Palsgrave is known now as the author of one of the earliest French grammars for English use,

Lesclarcissement de la Langue Francoyse (1530), a work which still has value as a treasury of idiomatic English of this unliterary period. It is very rare and was reprinted in France in 1852. Palsgrave translated into English Fullonius's Latin comedy *Acolastus* (1540).

PALSY. See PARALYSIS; PARALYSIS AGITANS.

PALTOCK, pâl'tŏk, ROBERT (1697-1767). An English author, born in London. He was educated at Saint Paul's School, studied law, and always lived in London. His fantastic romance, *The Life and Adventures of Peter Wilkins, a Cornish Man*, which probably appeared first in 1750, was published anonymously, and the author was not known for several years. He also wrote an inferior work, *Memoirs of the Life of Parnese* (1751).

PALUDAN-MÜLLER, pä'lu-dân mu'lĕr, FREDERIK (1809-76). A Danish poet, born at Kjerteminde. He entered the University of Copenhagen in 1828, studied law there, and afterwards traveled abroad. As early as 1831 he became known through some of his poems. A year afterwards his play *Kjaerlighed ved Hoffet* ("Love at Court") was successful, and the Byronic *Dansersinden* (1833) and the lyric drama *Amor og Psyche* (1834) established his reputation. But his most important work is *Adam Homo* (1841-48), a novel in verse. His other writings include: *Abels Død* (1854), *Dryadens Bryllup* (1844), *Benedikt fra Nursia* (1861), *Paradiset* (1861), *Absurcus* (1861), *Kalanus* (1861), the last a notable poem on the life of the Indian sage, and *Adonis* (1874), a romance, also in verse. His *Poetiske Skrifter* were published in 1878-79. His two prose works, *Ungdomskilden* ("The Fountain of Youth," 1865) and *Ivar Lykkes Historie* (1866-73), are among his most characteristic productions, although it is as a poet that he is best known.

PALUDISM. See MALARIA AND MALARIAL FEVER.

PALUS, pä'lōōz. A tribe of Shahaptian stock (q.v.) occupying the country about Palouse River and the adjacent portion of Snake River in southeastern Washington. They are closely connected with the Nez Percé and Yâkima, but, although mentioned as parties to the treaty made with the latter tribe in 1855, they have never come upon a reservation or recognized any treaty limitations, but still continue a wandering existence within their ancient territory. They retain most of their primitive characteristics and adhere to the religion of Smohalla (q.v.). They are supposed to number from 400 to 500.

PALY. A term in heraldry (q.v.).

PAMEKASAN. The capital of the island of Madura (q.v.).

PAMELA, OR VIRTUE REWARDED. A novel by Samuel Richardson (1740). Begun as a series of letters for the use of the illiterate, it grew into the story of a maid-servant dishonorably pursued by her mistress's son, who, after her withstanding his advances, finally married her. With all its defects, it is of interest as marking the starting point of the modern novel.

PAMIERS, pâ'myâ'. The capital of an arrondissement and an episcopal see in the Department of Ariège, France, on the Ariège, 40 miles south of Toulouse (Map: France, H 8). It has an ancient cathedral of mixed architecture, a communal college, a seminary, and a large hospital. It manufactures hardware, woolens, paper, and flour; has iron foundries and saw mills, and a trade in corn and wine. Population, in 1901, 10,886.

PAMIR, pâ-mēr', or THE PAMIRS (Pers. *Bāmi-dunyā*, Roof of the World). An elevated mountain region in Central Asia, forming in greater part the southeastern corner of Russian Turkestan, and bounded by Chinese or East Turkestan on the east and Bokhara and Afghanistan on the west, while on the south a narrow projection of Afghanistan separates it from the extreme northwestern part of British India (Map: Asia, G 5). It stretches in either direction about 170 miles, and its area is estimated at 36,000 square miles. Along its eastern boundary runs the short but lofty Sarikol Range, which is the nucleus from which the four great mountain systems of Central Asia radiate, the Hindu Kush toward the west, the Himalayas to the southeast, the Kuen-lun to the east, and the Tian Shan to the northeast. The culminating point of the Sarikol is the Mustagh-ata, 25,790 feet (or 24,400 feet, according to most recent measurements) above the sea. Westward the Sarikol sends out a number of parallel spurs or cross ranges dividing the country into level-floored valleys four or five miles broad. These valleys, which are known as Pamirs and form the characteristic feature of the country, lie from 10,000 to 14,000 feet above sea level. They differ in formation from the Tibetan Plateau, and seem to have been originally deep river-gorges which have been filled with detritus from the mountain sides. They are watered by the headstreams of the Oxus, and contain a number of beautiful lakes. The climate is very severe, cold and stormy; the mountains are always, and the valleys for more than half of the year, covered with snow. The country is treeless, but the valley floors are covered with grass which yields rich pasture in summer.

Though there is a considerable population in the extreme western valleys, the population of Pamir proper, or Russian Pamir, is very sparse, consisting only of a few hundred nomadic Kirghiz seeking the pastures during summer. The great plateau of Pamir was formerly regarded as the place of dispersion, if not of origin of the Aryan or Indo-European peoples. Its ethnological importance is lessened by the fact that the best opinion among investigators of Aryan prehistory to-day fixes the seat of this great branch of the white race in some part of Northern or Eastern Europe. The Pamirian region is, however, interesting from the fact that about it cluster Aryan peoples of a rather primitive sort, the remnants, in all probability, of the Aryan invasion of Asia and the representatives of a comparatively undeveloped Aryan character. Eastward of the Pamir was also the primitive home of the Chinese, while north of it lay the region of development of the Tatar or Turkic peoples. South of it various Aryan tribes have lived and wandered for ages. Here naturally, as languages, religions, customs, and habits show, considerable intermingling of races has taken place.

Considerable interest has been centred around

Pamir owing to its frontier position between Russian and British possessions, and during the last three decades of the nineteenth century it was probably more thoroughly explored than any other part of Central Asia. Great Britain desired in 1891 to have the region portioned between Afghanistan and China, but in the same year Russia sent an official expedition into the country in order to substantiate its claims. In 1895 the boundaries were defined as outlined above by a treaty between Russia and Great Britain. Russia has established a fortified outpost, Pamirsky Post, on the Murghab River. Consult: Bonvalot, *Through the Heart of Asia* (London, 1889); Geiger, *Die Pamirgebiete* (Vienna, 1887); Dunmore, *The Pamirs* (London, 1893); Cobbold, *Innermost Asia* (New York, 1900).

PAMLICO (păm'lē-kō) **SOUND.** The largest of the numerous sea-lagoons which line the eastern coasts of the United States. It stretches along the coast of North Carolina from Roanoke Island 80 miles southward, and has an average width of 20 miles (Map: North Carolina, F 2). It is separated from the Atlantic Ocean by long, narrow sand bars or beaches, which run out into an angle known as Cape Hatteras, and which are broken by the Ocracoke and Hatteras Inlets. The depth along the centre of the sound ranges from 10 feet in the north to 20 feet in the south, but on either side are large areas of shallow water, and the inner shores are lined with marshes. The Neuse and Pamlico rivers enter the sound through large estuaries, and north of Roanoke Island the Pamlico connects with the Albemarle Sound (q.v.). The fisheries on the Pamlico are important, and large numbers of wild fowl frequent its waters.

PAMMARI, păm-mä'rē. An Indian tribe of Brazil. See PURU-PURU.

PAMPA, păm'pä, LA. A territory of Argentina, bounded on the north by the provinces of Mendoza, San Luis, and Córdoba; on the east by Buenos Ayres; on the south by the Territory of Rio Negro; and on the west by the Territory of Neuquén and the Province of Mendoza (Map: Argentina, D 11). Its estimated area is 56,320 square miles. Its territory belongs almost wholly to the pampas region, with some hills and woodlands in the northwest, and médanos (shifting sand hills) in other portions. The Rio Colorado forms its southern boundary with an affluent, the Curaco, wholly within its territory. There are many lagoons and small lakes, into the largest of which flows the Rio Salado. Since the Indians were driven out in 1879 the country has been occupied by sheep and cattle ranches. The capital of the territory is General Acha (population about 2000), which has railway communication with the coast. The population of the territory, in 1895, was 25,914; in 1900 (estimated), 46,662.

PAMPANGA, păm-păn'gä. A province of Central Luzon, Philippines. It is situated north of Manila Bay, and bounded on the north by the Province of Tárlac, on the east by Bulacán, and on the west by Zambales (Map: Luzon, D 6). Its area is 2209 square miles. It is mountainous in the west, but the eastern and southern portions are taken up by a part of the low and marshy delta of the Rio Grande de la Pampanga. Agriculture is extensively carried on, yielding rice, sugar-cane, sweet potatoes, tobacco, and cotton. Industries are also well developed; just before the Spanish-American War there were over 12,000 looms and 177 steam sugar mills in operation. The population of the province in 1901 was 223,922, chiefly of the Pampanga race. The capital is Bacolor (q.v.).

PAMPANGA, RIO GRANDE DE LA. The second largest river of Luzon, Philippines, draining the greater part of the large central plain between Manila Bay and the Gulf of Lingayén (Map: Luzon, E 5). It rises on the Caraballo Sur and flows southward through the provinces of Nueva Ecija and Pampanga, emptying into Manila Bay through the numerous ramifications of a large, marshy delta. It is about 125 miles long, and receives several large and innumerable small tributaries. In the rainy season its inundations cover large extents of territory, which are converted into excellent rice fields.

PAMPANGO, păm-păn'gō. A group of tribes in Central Luzon speaking a Malay language and having at the conquest by Spain their own culture and mode of writing.

PAMPAS, păm'păz (Sp., Port. *pampa*, from South American Indian *pampa*, Quichua *bamba*, *banba*, plain). The designation of certain plains in South America. In Peru the name is applied to the forested region along the Ucayali River and also to the dry lake basins on the Andean Plateau. The more common signification of the term, however, refers to the immense grassy plains which occupy the central part of Argentina between the Rio Salado on the north and the Rio Negro on the south and which merge into the forested region of the Gran Chaco and the steppes of Patagonia. The pampas comprise an area of about 250,000 square miles, with a flat or gently undulating surface sloping toward the southeast and south. On their western border the elevation ranges from 1000 to 1300 feet above the sea, while along the Atlantic it is generally less than 100 feet. The soil is mostly clay of Quaternary and Tertiary age. During the wet season a luxuriant growth of grasses covers the plains, affording pasturage to great herds of cattle and flocks of sheep. A portion of the region along the Paraná is adapted to agriculture, and there are smaller areas of arable land in the interior. In the northern and western parts the surface is often broken by deep ravines or barrancas and by shallow depressions which are filled with brackish water during a part of the year. Strips of sandy, arid land are known as travesías. The inhabitants comprise the half-wild gauchos of mixed Spanish and Indian blood, who are chiefly occupied in hunting and grazing, and European immigrants. See ARGENTINA.

PAMPAS CAT. A robust, yellowish-gray wild cat, of the Argentine pampas and La Plata Valley. It is striped with straw-colored bands running obliquely backward across the flanks, and horizontally on the chest and legs. It has an exceedingly short head, and only two premolar teeth in the upper jaw. Other names are 'grass-cat' and 'straw-cat.' Hudson (*Naturalist in La Plata*, London, 1892) speaks of it as one of the most characteristic animals of the pampas; and Mivart notes the resemblance between it and Pallas's cat (*Felis manul*) of the steppes of Russia.

PAMPAS DEER. A small deer of Argentina (*Cervus campestris*), locally called 'guazuti,'

whose antlers are marked by the development of the forked posterior tine, and a consequent stunting of the unbranched front tine, giving three points to each antler. See Plate of FALLOW DEER, MUSK, ETC., with DEER.

PAMPAS DEL SACRAMENTO, dĕl säk'rä-mān'tō. An extensive plateau region in Northeastern Peru between the Huallaga and Ucayali rivers. It consists largely of open savanna country, and was settled by Jesuit missionaries in the middle of the eighteenth century, but is now almost uninhabited.

PAMPAS GRASS (*Gynerium argenteum*). A grass common in Brazil and Argentina, usually along watercourses, and not, as formerly stated, upon the pampas or vast plains of South America. It has been introduced into various countries as an ornamental plant. It is quite hardy in England, but requires protection in winter as far north as New York. Its tufts have a splendid appearance. The leaves are six to eight feet long, the ends hanging gracefully; the flowering stems 10 to 14 feet high; the panicles of flowers silvery white, and from 18 inches to 2 feet long. The herbage is too coarse to be of any agricultural value. The male and female flowers are on separate plants, in panicles, the palee of the female florets elongated, awn-shaped, and woolly. The pampas grass is grown commercially in California, where it was introduced about 1880. Another Brazilian species of the same genus, uva grass (*Gynerium saccharoides*), yields a considerable quantity of sugar. Stapf, in a monograph of this genus, published in the *Gardener's Chronicle* for 1897, separates the genus, placing the pampas grass in the genus Cortaderia, and leaves *Gynerium saccharoides*, or uva grass, as the only representative of Gynerium. For illustration, see GRASSES.

PAMPELUNA, päm'pā-lōō'nä. A city of Spain. See PAMPLONA.

PAM'PHILUS (Lat., from Gk. Πάμφιλος, *Pamphilos*). A Greek painter of the early fourth century B.C. He was a native of Amphipolis, but studied and lived at Sicyon, where he succeeded his master, Eupompos, as the head of the Sicyonian school. Of his works we hear of a "Battle at Phlius," painted for the Athenians, "Odysseus on the Raft," and apparently of a "Cognatio" or "Relationship," which may have been a family group, though the text of Pliny is probably corrupt at this point. It is possible also that Aristophanes refers to a painting by him of the Heraclidæ as suppliants at Athens. He was noted for his thorough technical knowledge, insisting that arithmetic and geometry were necessary to the painter, thus performing for painting a service similar to that which the Canon of Polyclitus did for sculpture. Through his influence, we are told, drawing was introduced into the schools as part of the education of free-born boys. This scientific training always characterized the Sicyonian school, and was emphasized by the great pupils of Pamphilus, Apelles and Melanthius.

PAMPHILUS (?-309). A Christian teacher and writer of the fourth century. He belonged to a good family of Berytus (Beirut, Syria, studied under Pierius of Alexandria, and spent most of his life as a priest at Cæsarea in Palestine, where he founded a Christian school and established a valuable and celebrated ecclesiastical library. He multiplied copies of the Scriptures and gave liberally to the poor. He was an admirer of Origen and teacher of Eusebius, who took the name of Eusebius Pamphili. With Eusebius he prepared an edition of the *Septuagint* from the text in Origen's *Hexapla*, which was generally used in the Eastern Church. During the persecution of the Christians under Maximinus he was imprisoned (307-309) and employed himself in writing an apology for Origen in five books, to which Eusebius added a sixth. All of the work has perished and our knowledge of it depends upon the untrustworthy Latin translation by Rufinus of Book I. and Photius's summary. Pamphilus died a martyr in 309. Consult his literary remains in Migne, *Patrol. Græca*, xx., xvii.

PAMPHLET (of uncertain etymology). A small book, whether stitched or bound, with or without covers, written to provoke discussion on some topic of current interest. On its first appearance among English writers, the word seems to have been used to designate any booklet, whatever its aim. It was so employed by Richard of Bury (died 1345), in his *Philobiblon*, a Latin hand-book to his library at Durham College; and by Caxton in his *Eneydos* (1490), where printed matter is classed as 'pamflettis and bookys.' Sometimes single pieces of verse in manuscript or in print were also called pamphlets by the poets of the fifteenth century. But since the Reformation, when pamphlets began to be employed in controversy, they have come to stand mainly for a class of writings that deal with questions of the day, in politics, religion, and literature. They are thus to be differentiated from academic theses and dissertations and from all other short scientific treatises written with a calm didactic aim. Besides being brief, pamphlets are spirited in style and often vehement and angry in tone. The sober pamphlet is represented by Sidney's *Apologie for Poetrie*, and the vehement by Milton's *Tenure of Kings and Magistrates*. Both are pamphlets by virtue of their controversial aims.

A history of English pamphlets would fall little short of a history of English institutions from the establishment of the House of Tudor to the death of George III. In them as nowhere else is to be found the story of the fierce controversies whereby Protestantism won against the Roman Catholic Church, and whereby the English people wrested from their kings their social and political rights. Several hot debates have also marked the course of our literature. Somewhat earlier than the date here assigned, the pamphleteer was abroad. Wiclif, for example, circulated among the people little sheets copied by the poor priests, in which an appeal was made against the abuses of the professional clergy and against the current authority in religion. Of these tracts the *Septem Heereses* is perhaps the most famous. The beginning of the Reformation in England has been ascribed, of course with exaggeration, to the *Supplycacyon of Beggers* (1529) of Simon Fish, copies of which were strewn abroad in the streets of London, apparently with the connivance of Henry VIII. As no other pamphlet had yet done, it let the public view concerning "the ravens in wolves going in shepherds' clothing and devouring the

flocks.' With little effect Sir Thomas More replied to Fish in the *Supplycacyon of Soulys*. This incident is but an example of what was taking place everywhere throughout the Reformation period. Erasmus, Luther, and Melanchthon were all pamphleteers. The Anglican Church was no sooner established than it was attacked by the Puritans, for example, by Thomas Cartwright in an *Admonition to the Parliament* (1572). Then followed the Martin Marprelate controversy (q.v.), the most heated religious dispute in the reign of Elizabeth. At this time, too, were debated, in stitched sheets of varying length, questions in literature, especially the essence and form of poetry, and the principles underlying the drama. In these discussions some of the great Elizabethans bore a hand, like Campion, Daniel, and Sidney.

Numerous as were the pamphlets in the Elizabethan age, they were but a sign of the deluge that was to come during the great Civil War, when the passions of sects and factions ran high. Prynne alone, it is estimated, was the author of nearly two hundred pamphlets, of which may be cited *A Looking Glass for All Lordly Prelates*. If he was the most prolific of all the Puritan pamphleteers, it must be remembered that he was only one among hundreds. Indeed, on both the Puritan and Royalist sides the news-letters which were issued in all the larger towns were little more than controversial pamphlets. Milton dropped his poetry and entered the lists on a variety of questions, discussing in turn education, divorce, the press, and the right to put to death kings and magistrates. Substantial as are Milton's tractates, as he sometimes called them, he was surpassed in brevity and directness by Col. Edward Sexby in *Killing No Murder* (1657), addressed to 'His Highness, Oliver Cromwell,' and containing the memorable sentence: "Let this consideration arm and fortify your Highness's mind against the fears of death, and the terrors of your evil conscience, that the good you will do by your death will something balance the evils of your life."

After the Restoration (1660), freedom to print was strongly repressed by the Government, and pamphlets had to be printed and circulated privately. Still, one should not forget *A Rough Draft of a New Model at Sea* (passed about in manuscript during 1667), in which George Savile, Marquis of Halifax, attacked the scandalous behavior of the navy in the war with the Dutch; nor the protests of the Quaker George Fox against the formalism of the established Church; nor the virulent debate between Samuel Parker and Andrew Marvell on the relation of Church and State. Much of the literature of the time, as Dryden's essays and satires, was also controversial in tone and was issued in pamphlet form.

Dr. Johnson was probably right in describing the reign of Queen Anne as *par excellence* the age of pamphlets. The Revolution of 1688 had transferred political power to the House of Commons; two great parties, Whig and Tory, had come into existence, depending for the retention of office upon the people; and by the lapse of the licensing act in 1695, the press had become practically free. As the newspaper had not yet become thoroughly organized, the pamphleteer was a necessity for explaining, defending, and attacking public policies. Party spirit extended to literary questions, and dissent from the State Church was assuming new forms. Under these circumstances, the pamphleteer reaped a harvest. To pass over the horde of minor writers, the Marquis of Halifax, already mentioned, paid his compliments to Whig and Tory, in *Some Cautions for the Choice of Members of Parliament* (1695), and gave the Dissenters some excellent advice in *A Letter to a Dissenter* (1687), a tract that went everywhere and provoked a score of replies. Defoe in *The Shortest Way with the Dissenters* (1702) urged the complete extirpation of all Dissenters—a piece of irony surpassed only by Swift. Charles Leslie—"a reasoner not to be reasoned against," said Dr. Johnson—rode roughshod over Quakers and Deists. William Law attacked the latitudinarian opinions of the Bishop of Bangor, and two hundred pamphlets followed from fifty different pens. Of all his contemporary pamphleteers, Swift was easily the prince. His *Argument to Prove that the Abolishing of Christianity . . . May be Attended with Some Inconveniences* (1708) is a superb example of ironical humor. Swift also performed valuable services to the Tories in many pamphlets, of which may be mentioned *The Conduct of the Allies* (1711) and *Some True Thoughts Upon the Present State of Affairs* (1714). The condition of Ireland was handled in a masterly manner in the *Drapier's Letters* containing the famous "Modest Proposal." With Arbuthnot, Pope, and others, he joined in excellent foolery aimed against literary quacks and poetasters. Of this joint work the best is perhaps *The Art of Political Lying* (1712), mostly from Arbuthnot, though Swift bore a hand.

Later in the eighteenth century there were other debates in which were active Bolingbroke, 'Junius,' who may have been Sir Philip Francis, and Burke, who defended the French Revolution. The rise of the great reviews soon after 1800 turned controversy into new channels. Still the war of pamphlets has never quite ceased. Bowles and Byron fought over the question as to whether Pope was a poet; and pamphlets played an important part in the discussion over the poor laws, the corn laws, the Crimean War, the Irish land laws, the Armenian massacres, and the struggles between the shifting parties in the Church. Even nowadays, a poet occasionally challenges his reader by issuing his verse in pamphlet form. Such, for example, seems to be the intent of John Davidson, who began in 1901 a series of verse pamphlets dealing with the religious and philosophical questions of special interest at this time. Consult Arthur Waugh, *The Pamphlet Library* (4 vols., London, 1897-98). This work contains examples of political, religious, and literary pamphlets, from Wiclif to Newman. There are also historical essays under each division.

PAMPHYL'IA (Lat., from Gk. Παμφυλία). In ancient geography, a country on the south coast of Asia Minor, with Cilicia on the east and Lycia on the west. On the north it was separated from Pisidia by the Taurus range, and the southern boundary was formed by the crescent-shaped Gulf of Attalia. The population was a mixed race, in which there was a strong Greek element, and the inscriptions show a dialect strongly resembling that of Cyprus and Areadia, which seems to indicate Greek immigration prior

to the Dorian conquest of the Peloponnesus. The chief cities, Perge, Sillæum, Aspendus, and Side, were Greek, but the country early lost touch with the mother country and plays no part in Greek history, though it was on the river Eurymedon in Pamphylia that the Athenian Cimon won his great victory over the Persians. The country was freed from the Persian rule by the conquests of Alexander, and after his death passed into the hands of the Seleucid kings of Syria. With the rise of Pergamum it became a part of that kingdom, and Attalus II. founded the city of Attalia, now Adalia. With the rest of the kingdom it passed to the Romans, and from this time shared the history of the rest of Asia Minor. For the inscriptions, see Collitz, *Griechische Dialekt Inschriften*, vol. i. (Göttingen, 1884). Consult also: Lanckoronski, *Die Städte Pamphyliens und Pisidiens* (Vienna, 1890); Ramsay, *Historical Geography of Asia Minor* (London, 1890).

PAMPLONA, pām-plō'nā (often called by English writers **PAMPELUNA**, pām'pe-lōō'nā). The capital of the Province of Navarre (Navarra), in Northern Spain, and in the Middle Ages capital of the Kingdom of Navarre. It is situated on an eminence dominating the surrounding plain among the foothills of the Pyrenees, 16 miles from the French frontier (Map: Spain, E 1). It is a military station of the first class and is surrounded by a circle of detached forts. The streets in the old quarters are narrow, while in the suburbs have sprung up many modern houses lining broad and well-kept streets. The city has three beautiful plazas, of which the Plaza del Castillo, with its arcades flanked by the edifice of the provincial deputation and the simple modern theatre, is the best, and four charming promenades and the park-like Forest of Tijería; while among the principal buildings are the Gothic cathedral, begun in 1397, with a Græco-Roman façade, and the historic Sala Preciosa, where formerly met the Cortes of Navarre; the ornate municipal palace, the viceregal palace, and the bull ring, capable of seating 8000 persons. The aqueduct of Noain, eight miles long, for a portion of its course supported by 97 arches, furnishes the city with its water supply. The town possesses also a large hospital, a provincial institute, normal schools, and a seminary. The chief manufactures are linen, flour, soaps, beverages, leather, and paper, and there are iron, lead, and copper foundries. Population, in 1887, 26,663; in 1900, 30,609.

The name Pamplona is said to be derived from *Pompeiopolis* (the city of Pompeius), though this etymology is disputed. Being a fortified frontier town, Pamplona has figured in the wars with the French and also in the Carlist wars.

PAMUNKEY, pā-mŭŋ'ki. A former leading tribe of the Powhatan confederacy (q.v.) of Virginia and one of the very few tribes of the Atlantic Coast region of the United States which have retained their organization. On the first colonization of Virginia in 1607 they were estimated at nearly three hundred warriors, being the largest tribe of the confederacy. Their most noted chiefs were Opechancano (q.v.), Totopotomoi, and Queen Anne. The war begun under Opechancano in 1622 resulted in the destruction of their town, which was burned by Governor Wyatt in 1625, after a desperate battle in which he met and defeated nearly 1000 Indians. A second rising in 1644 ended a year later in the capture and death of Opechancano and the disruption of the confederacy, each tribe, including the Pamunkey, making a separate treaty of peace and being assigned to a reservation held on condition of the payment of an annual tribute. About the year 1654 the Pamunkey suffered another terrible loss in the death of their chief Totopotomoi with nearly one hundred of his men, who had volunteered their services to the English to repel an invasion of a hostile mountain tribe. Queen Anne, the widow and successor of Totopotomoi, maintained her friendship with the English, and for her services in later Indian wars was presented with a silver coronet by the English Government. In 1781 the Pamunkey occupied the same reservation which they still hold, consisting of a few hundred acres in a bend of Pamunkey River. Here about 140 mixed-bloods still keep the name and tribal organization under State laws. They are all fishermen or hunters, making a good living from their annual catch. They do not vote or pay taxes, but still present the Governor of Virginia an annual tribute of game in token of their former submission.

PAN (Lat., from Gk. Πάν, connected with Lat. *pasci*, to feed, *pastor*, shepherd, Skt. *pā*, to protect). A Greek god of herds and hunters, pastures and forests. He seems to have been originally the god of shepherds and goatherds, while he is but slightly connected with neat cattle, which formed a very unimportant part of the wealth of the region where his cult grew up. This was especially the mountainous district of Arcadia, and the varied aspects of the god can be easily referred to the wandering life of the herdsmen, which led them from the lower pastures and valleys up to the high mountains and cooler regions in the summer. From this life also is derived Pan's connection with the hunt and fishing, as both are diversions of the herdsman's life. He seems to have passed into a war-god with the growth of the mercenary service of the Arcadians, though from relatively early times we hear of the *Panic fear*, which he inspired. This seems derived from the apparently causeless 'stampedes' of herds, often hurrying them to destruction, and the observation that similar frenzy seemed to seize an army at times and drive it into mad rout. Pan is not mentioned in the epic, and his worship seems to have spread but gradually beyond Peloponnesus. It was introduced into Athens after the battle of Marathon, when Pan was believed to have fulfilled a promise to help the Athenians. A sanctuary in a cave on the northwest side of the Acropolis was then given to him, and many votive reliefs of Pan and the nymphs attest his popularity. He was also honored with annual sacrifices and a torch race. Owing to the character of his cult, the legends about Pan are largely local. He is called the son of Zeus and Callisto and twin brother of Arcas; of Hermes and the daughter of Dryops, or Penelope; or by later mythographers, who connected the name with πᾶν, 'all,' as the son of Penelope and all the suitors. A late Homeric hymn tells of his birth, and how Hermes carried him to Olympus, where he delighted all the gods. Later philosophers, especially some of the Stoics, transformed this divinity into the great All-God, but this was never a general belief. Pan's appearance was described in accord-

ance with his nature. Goat's legs and horns, a shaggy beard and hair, and goat-like features suggest his origin, and this type is common in art, though associated from the middle of the fifth century B.C. with another, representing him as a youth, whose animal nature is only marked by short horns on the forehead. Hellenistic art also introduced female Pans and child Pans, though the Greek religion knew of but the one god. In art he became attached especially to Dionysus, perhaps on account of the satyrs. The artistic type of Pan seems also to have contributed to the development of the popular representations of the Devil in the earlier Christian art.

PA'NA. A city in Christian County, Ill., 99 miles northeast of Saint Louis, Mo., on the Illinois Central, the Baltimore and Ohio Southwestern, and the Cleveland, Cincinnati, Chicago and Saint Louis railroads (Map: Illinois, C 4). It carries on considerable trade, and is largely engaged in coal-mining. Settled in 1853, Pana was incorporated by a special charter in 1867. The government is administered under a general law of 1870, which provides for a mayor, elected every two years, and a council. The city owns and operates the water-works. Population, in 1890, 5077; in 1900, 5530.

PANÆTIUS, pā-nē'shĭ-ŭs (Lat., from Gk. Παναίτιος, *Panaitios*) (c.185-c.112 B.C.). A Greek Stoic philosopher, born at Rhodes. He studied and taught in Athens, where Lælius became his pupil. He went to Rome, and became one of the literary circle patronized by the younger Scipio; but it seems that he returned to Athens several years before his death. He belonged to the Middle (or eclectic) Stoa, borrowing much from Plato and Aristotle; and his great work on moral obligation was the basis of Cicero's *De Officiis*. Consult: Van Lynden, *De Panætio Rhodio* (Leyden, 1802), and Fowler, *Panætii Fragmenta* (1885).

PANAMA, pă'nà-mä'. A department of Colombia, South America, bounded by the Caribbean Sea on the north, the Colombian department of Cauca on the east, the Pacific on the south, and Costa Rica on the west (Map: Colombia, B 2). Its area is 31,571 square miles. The department is only sparsely settled, and the population in the cities is supported chiefly by the inter-oceanic commerce. Agriculture is in a backward state, but stock-raising is becoming important. The commerce has greatly increased since the opening of the Panama Railway, connecting Panama, the capital, with Colón. The population was estimated at 285,000 in 1896. Consult: Peratta, *Costa Rica, Nicaragua y Panamá* (Madrid, 1883); Reclus, *Panama et Darien* (Paris, 1881).

PANAMA. The capital of the Department of Panama, Colombia, situated at the head of the Bay of Panama, on the south shore of the Isthmus. It is at the southern terminus of the Panama Railroad and of the canal route (Map: Colombia, B 2). Though its streets are narrow, the town is well built, and has a large cathedral, a Jesuit college, several convents, a modern hotel, and a hospital, built by the Canal Company. The inhabitants are supported almost wholly by the inter-oceanic transit trade, and, since the definite proposal of the United States Government to complete the Panama Canal (q.v.), the importance of the town has been much enhanced. The harbor of the town itself is shallow, and large boats formerly had to anchor seven miles from the landing place, being loaded and unloaded by means of small steamers and lighters. In 1898, however, a new wharf 1000 feet long and accessible for large steamers was completed at the canal terminus. The population of the city is about 25,000. Panama was founded in 1519 by Pedro Dávila, being the first town founded by Europeans on the American continent. During the seventeenth and eighteenth centuries it was the chief port for the Spanish trade in the Pacific. In the nineteenth century its commerce declined, but received a new impetus by the completion of the Panama Railroad in 1855. It has often suffered from civil wars.

PANAMA, Isthmus of. A narrow strip of land extending between the southern end of the active volcanic region of Central America and the northern termination of the Andes (Map: Central America, G 6). Its outline is that of a gentle arc stretching in an east and west direction, its limit on the east being the Atrato River, and on the west the southeastern boundary of Costa Rica. In a broad sense much of major Central America is included in this Isthmian region, but the expression is commonly confined to the limits of country here indicated, extending between the meridians of 79° and 83° W. longitude, or about 415 statute miles. Its average width is nearly 70 miles, which is reduced to 31 miles between the bays of Panama and San Blas. There is no well-defined coastal plain, though occasional stretches of beach, as at Panama, are exposed at low tide, but their continuity is interrupted by abrupt cliffs and mountains fronting on the sea. The surface of the greater part of the Isthmus consists of low mountains and hills covered with dense forests. These elevations are not arranged in systematic chains or ridges, but are very irregularly distributed. Only in the extreme west and in the neighborhood of San Blas are there mountains of systematic arrangement. With these exceptions the topography consists of hills from 200 to 1500 feet in height, separated by drainage valleys that are cut down almost to sea level. There are, however, a few small areas of nearly level treeless upland, as from the mouth of the Bayano River to the Costa Rican boundary on the Pacific side. The region assumes the character of lofty mountains in its western section, where also are found a number of towering and seemingly extinct volcanoes (Chiriqui, Pico Blanco, both over 11,000 feet in height).

There is no well-defined water parting. The drainage is about equally divided between the two oceans. The streams are of great age, and the larger rivers, receiving the waters of many branches, usually reach sea level so far inland that they become tidal rivers, sometimes at a distance nearly half way across the Isthmus. The Atrato, rising in Colombia about latitude 4° N., flows nearly 600 miles almost due north into the Gulf of Darien, with a fall of less than one foot to the mile. The Tuyra drains most of the country west of the Atrato as far as the Gulf of Panama and empties into the Pacific. This is the largest drainage basin of the Isthmus. Farther westward the Bayano, with many tributaries, drains the central part of the Isthmus. It

is succeeded farther west by the drainage of the Chagres Basin, whose waters are carried to the Caribbean, though the basin extends nearly to the Pacific. From the Chagres to the Costa Rican border, the drainage consists of less complicated streams rising nearer the central or axial line and flowing into either ocean. Thus the drainage of the eastern or larger part of the Isthmus is complex and reaches the sea by concentrating into three principal channels, while to the westward it is simple.

Among the hills covering the Isthmus are a number of natural passes which afford the easiest routes between the two seas. These passes are: Culebra (287 feet); Atrato-Suenbti (583 feet); Atrato-Napipi (778); Caledonia (1003); San Blas (1142); and Atrato-Morte (1143).

The mean annual temperature, 78° to 80° F., is somewhat higher on the Atlantic coast, owing to the warmer waters of the Caribbean. The extreme annual range of temperature rarely exceeds 30°, the limits being 65° and 95° or 100°. The entire region is under the influence of the northeast trades between December and April, and in the remainder of the year these air currents are replaced by southeasterly winds. The rainfall is very heavy, and the climate is very unhealthful. The whole region is covered with a jungle of grasses, sedges, wild plantains, and trees characteristic of the lower lands of the Caribbean. Owing to less copious rainfall, vegetation is less exuberant on the Pacific than on the Atlantic side. The oceanic fauna on the Caribbean side differs greatly from that on the Pacific side, and even the land animals differ in the same way, to some extent.

The general level of the Isthmus has been enormously lowered by long continued erosion. The surface is rapidly approaching base level. Antiquity is stamped upon every form. The igneous rocks are now exposed by erosion. But the volcanic fires which still persist eastward in the Andes and westward in Central America have long ceased to exist in the Isthmus. There is no evidence that the oceans have ever communicated across the Isthmian regions since Tertiary times. If the Isthmus could be lowered 300 feet at present the waters of the two oceans would commingle through the low Culebra Pass.

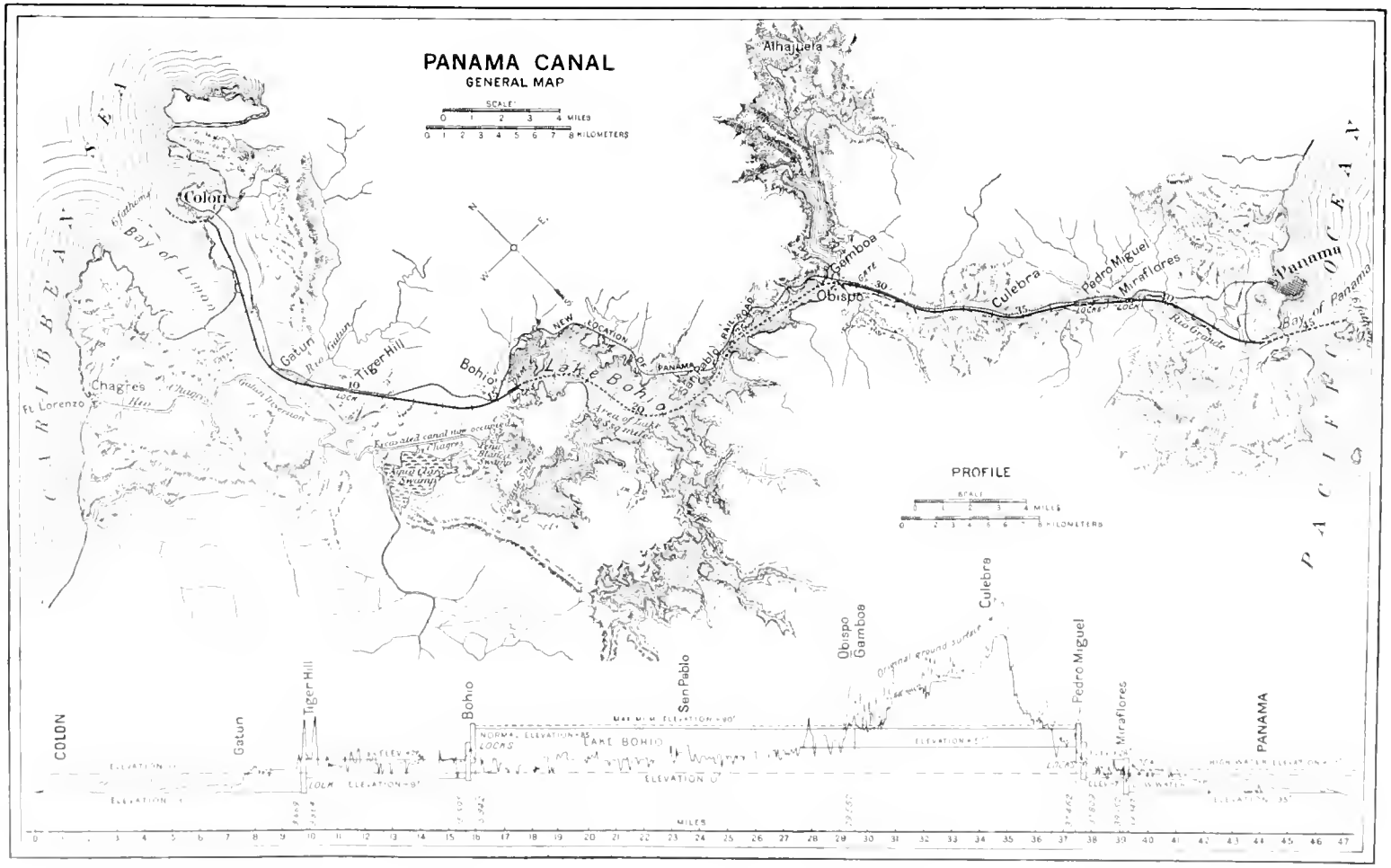
Most of the inhabitants are a mixed people of Spanish, Indian, and negro origin. Some of the aborigines, however, as the Guaymi and Chocos, have preserved their physical type, customs, and speech. The Isthmus is thinly peopled and has no very important towns except the ports of Panama and Colón, the termini of the Panama Railroad and of the proposed Panama Canal. Politically the Isthmus proper forms the Panama department of the Republic of Colombia. In other respects, however, it has small relations with the Republic. Its ports are not used in the commerce of the rest of Colombia; there is very little trade between the Isthmus and the other departments, and its railroad is merely a means of transport for the commerce (duty free) of other nations. The most complete treatment of the geographic and geologic aspects of the Isthmus is contained in Hill, "The Geological History of the Isthmus of Panama and Portions of Costa Rica," *Bulletin of Museum of Comparative Zoology at Harvard University*, vol. xxviii., No. 5 (Cambridge, 1903); and of the Isthmus in all its features in Reclus, *The Earth and Its Inhabitants, North America*, vol. ii. (New York, 1893).

PANAMA CANAL. The projected ship canal across the Isthmus of Panama, connecting the Atlantic and Pacific oceans. The first project for the construction of such a canal to result in the actual beginning of the work grew out of a concession granted by the Government of Colombia to Lieut. Lucien N. B. Wyse and others in May, 1878, giving to them the exclusive privilege, for 99 years, of constructing and operating a canal across the territory of the Republic between the Atlantic and Pacific oceans. An international congress of 135 delegates, mostly engineers, 11 being from the United States, was held at Paris in May, 1879, under the auspices of Ferdinand de Lesseps, who had been induced to assume the leadership in the undertaking, and after a session of two weeks decided that the route for the canal should be across the Isthmus of Panama, between the cities of Colón and Panama, and that the canal should be a sea-level one and without locks. For the purpose of construction the Panama Canal Company, officially known as the 'Compagnie Universelle du Canal Inter-océanique de Panama,' was organized under the laws of France with Lesseps as president. It purchased the Wyse concession for 10,000,000 francs, and at once entered upon the task of surveying the route and doing other preliminary work. The plan adopted provided for a sea-level canal 29.5 feet in depth, with a bottom width of 72 feet, involving an excavation of 157,000,000 cubic yards of earth and rock. The estimated cost of construction, as calculated by Lesseps, was $127,000,000, and the time required was estimated at eight years, both of which estimates were considerably under those made by the International Congress. Work was begun in 1881, but in a short time it became evident that the undertaking involved difficulties which had not been foreseen, and that the estimates were absurdly low. In order to obtain additional funds and to retain the confidence of the French public, bribery on an almost unprecedented scale was resorted to, prominent newspapers were subsidized, and a number of members of the French Chamber of Deputies were corrupted. In 1892 many of the transactions of the company or its agents became known to the public, and the disclosures, implicating a number of the most prominent men in France, gave rise to perhaps the greatest financial scandal in French history. The company was declared to be bankrupt, and it was found, on examination, that up to this time 1,300,000,000 francs had been expended; that the assets of the company amounted to only 700,000,000 francs, and that only a small part of the work had been done. The company was dissolved by the French courts and a receiver was appointed to take charge of its affairs. The receiver was authorized to cede to any new company all or a part of the assets and to borrow money and make contracts with a view to completing the work of construction. He asked for and received from the Government of Colombia three successive extensions of time within which the canal was to be completed and put into operation. The last extension gave the promoters until 1910 to complete the work. The receiver finally succeeded in October, 1894, in organizing the new Panama Company, with a capital stock of 650,000 shares of 100 francs each (about $13,000,000),

the Government of Colombia subscribing for 50,000 shares. The property and assets of the old Panama Company were now transferred to the new Panama Company. An international technical commission composed of ten eminent engineers, representing the United States, Great Britain, Germany, and France, was appointed to investigate the subject, and in November, 1899, reported unanimously in favor of the feasibility and practicability of completing the canal. They reported that the canal was already two-fifths completed, that not more than $102,400,000 would be needed to finish the work, and that the time need not exceed ten years. The work of construction was then resumed on a small scale. Up to June 30, 1899, the new company had expended about $8,000,000 and had excavated about 5,000,000 cubic yards of earth.

In 1899 President McKinley was authorized to appoint a commission of eminent engineers and other persons to investigate the whole question of canal possibilities on the Isthmus from Nicaragua to Colombia. After an exhaustive investigation the commission reported in favor of the Nicaragua route, chiefly on financial grounds, but upon the offer of the Panama Canal Company to sell its property and franchises to the United States for $40,000,000, its value as estimated by the commission, the commission made a supplementary report advocating the acceptance of the offer and the completion of the unfinished canal by way of Panama. In Congress discussion of the respective advantages of the Panama and Nicaragua routes was long and earnest, finally ending in June, 1902, by the enactment of a law authorizing the President of the United States to purchase the property and franchises of the Panama Canal Company for $40,000,000, provided a satisfactory title could be secured, and further authorizing the Secretary of War in that event to construct the canal at a cost not to exceed $130,000,000. Negotiations were at once entered upon with the Republic of Colombia to secure the necessary concessions, and a thorough investigation was begun to ascertain the character of the legal title of the Panama Company to the property which it proposed to sell. Upon investigation it was found that the company had a valid title, and on February 16, 1903, the Government of the United States formally accepted the offer of the company to sell its rights and property for $40,000,000, subject to the ratification of the treaty with Colombia then pending before the Senate. This treaty had been concluded after a long negotiation between the two governments, lasting through a period of six months, the delay being caused by disagreement of the two governments as to the price to be paid for the concession. In January, 1903, the treaty was laid before the Senate for ratification, but on account of opposition of a few Senators, under the leadership of Morgan, of Alabama, who favored the Nicaragua route, the Fifty-seventh Congress closed without action on it. An extra session of the Senate was called to meet on March 5th, and after two weeks of debate the treaty was ratified on March 18th by a vote of 73 to 5. The treaty provides that the United States shall pay to the Republic of Colombia the sum of $10,000,000 in gold in cash for the concessions, to be paid upon the exchange of ratifications, and an annuity of $250,000, beginning nine years after the date of ratification, the latter sum being a compromise between the $600,000 demanded by Colombia and the $100,000 offered by the United States. The concession authorizes the new Panama Company to transfer to the United States all its property and franchises, including the Panama Railroad. The lease is for 100 years, with the privilege of perpetual renewal. The treaty further provides that the territory comprising the canal zone shall be neutral and under the guarantee of both governments. If it should become necessary at any time to employ armed forces to maintain the safety of the canal or insure its public use, the Republic of Colombia agrees to provide the necessary troops. Provision is made for a joint American and Colombian commission to establish and enforce sanitary and police regulations. Colombia agrees not to cede or lease any territory to any foreign power within certain limits for coaling stations, fortifications, etc., that might interfere with the construction, protection, safety, and free use of the canal, and the United States agrees to support Colombia in preventing the occupation of any such territory. Panama and Colón are to be free ports for vessels and goods intended to pass through the canal, which, it is agreed, shall be open for traffic within fourteen years, unless the United States should determine to make the canal a sea-level enterprise, in which event the time is to be extended ten years longer. In the summer of 1903 the treaty was before the Colombian Government for ratification. Already by the Hay-Pauncefote treaty (q.v.) of November, 1901, superseding the Clayton-Bulwer treaty (q.v.), the sole right of the United States to construct, maintain, and police the canal was conceded by Great Britain, which power at the same time withdrew its claim to a joint guaranty of the neutrality of the canal upon the agreement of the United States to accept substantially the rules now governing the free navigation of the Suez Canal.

The principal advantages claimed for the Panama route are: First, the existence of excellent natural harbors at both termini of the proposed canal and the existence of a line of railroad across the Isthmus, which will make it practicable to begin work without delay; second, the estimated annual cost of operating the Panama Canal will be $1,300,000 less than the corresponding charges for the Nicaragua Canal; third, the Panama route is 134.57 miles shorter in length than the Nicaragua route, has less summit elevation, will have fewer locks, 26.44 miles less curvature, and will require but twelve hours time for a deep-draught vessel to pass through, whereas it would require 33 hours in the case of the Nicaragua Canal. The estimated time for constructing the Nicaragua Canal is about six years, the cut through the divide west of the lake consuming about four years. The time estimated for completing the Panama Canal is eight years, the excavation through the Culebra section (43,000,000 cubic yards of hard clay) being the greatest obstacle. The estimated cost of constructing the two canals, including the $40,000,000 to be paid the new Panama Company for its property and concessions, but excluding the cost of acquiring concessions from the governments concerned, is $189,000,000 for the Nicaragua Canal and $184,000,000 for the Panama Canal. Finally, the remoteness of active volcanoes and the less likelihood of injury from earthquakes is an advantage commonly claimed



MAP SHOWING ROUTE AND PROFILE

for the Panama route. Among the disadvantages charged to the route are the (assumed) comparative unhealthfulness of the climate, which, it is thought, might impede the work of construction, and the remoteness of the Panama route as compared with the Nicaragua route from the highways of commerce between the Pacific and Atlantic coasts of the United States. On the other hand, the Panama route gives the direct short course to the Pacific ports of South America.

Consult: *The Report of the United States Isthmian Canal Commission, 1899-1901* (Washington, 1901); *The New Panama Canal Company* (official publication) (New York, 1899); and *Canal de Panama, rapport de la commission* (Paris, 1899).

Consult also the authorities cited under NICARAGUA CANAL.

PANAMA CONGRESS. A congress of delegates respresenting various nations of America, which met at Panama in June, 1826, for the consideration of questions of common interest. Soon after the establishment of the independence of the South and Central American republics and of Mexico, a movement, largely under the direction of Simon Bolivar (q.v.), President of Colombia, was set on foot for the organization of an American Confederacy. In 1823 Bolivar invited the governments of Mexico, Peru, Buenos Ayres, and Chile to send to Panama delegates empowered to take such action; but Buenos Ayres and Chile held back, and in December, 1824, Bolivar sent a circular letter to all the Spanish-American republics, proposing that each appoint representatives to assemble immediately at Panama. This invitation was promptly accepted by Mexico, Peru, Chile, and Guatemala, and in November, 1825, the ministers of Mexico, Colombia, and Guatemala at Washington formally invited the United States to send delegates to the proposed congress, stating in a general way the questions which would be brought up for discussion. President Adams, influenced largely by Henry Clay, then Secretary of State, promptly accepted the invitation and in his annual message to Congress stated that "ministers will be commissioned to attend." This was the signal for one of the most animated debates in the history of the United States Congress, opposition being aroused particularly by the fear of 'entangling alliances,' by the proposed discussion of the recognition of Haiti, the suppression of the slave trade, and the liberation from Spanish rule of Cuba and Porto Rico, and to some extent by the reluctance on the part of many to commit the United States to the policy enunciated in the 'Monroe Doctrine.' Finally, however, Adams's appointment of two envoys extraordinary, Richard C. Anderson and John Sergeant, was ratified by the Senate, and an appropriation for the mission was voted in the House. The congress met on June 22, 1826, Colombia, Central America, Peru, and Mexico being represented. Chile, Brazil, and Buenos Ayres approved of the congress, but did not send delegates. After holding ten sessions and agreeing to a treaty of perpetual union for defense against Spain, the congress adjourned to meet again at Tacubaya, Mexico, in the following year. The treaty of union was subsequently ratified only by Colombia. The United States was not represented, Anderson having died on the way to Panama, and Sergeant not reaching that place until after the congress had adjourned. The meeting at Tacubaya was never held.

PANAMA HATS. Hats made from the immature unexpanded leaves of the stemless screwpine (*Carludovica palmata*), a native of Central America and Colombia. After special treatment to remove the soft parts of the leaf, the fibre is soaked to render it pliable, and the weaving is done under water. The hats most valued are made from single leaves.

PAN-AMERICAN CONGRESS. After the failure of the Panama Congress, held in 1826 for the purpose of taking measures looking toward a close union among the American republics for the furtherance of their common welfare, various efforts followed at intervals to bring together a congress of all the American States with a view to a more lengthy and earnest discussion of the important questions of common interest to the republics of America. Finally in 1847 a congress representing five South American republics was held at Lima and resulted in treaties of confederation and of commerce and navigation, a consular convention, and a postal treaty. Again in 1864 a congress of delegates representing seven South American republics and one Central American State was held at Lima for the purpose of forming a Latin-American Union. The sessions were secret and its work was without substantial result. In 1878 a third congress was held at Lima and consisted of representatives from seven South American States and the island of Cuba. Treaties of international law and extradition were prepared and afterward ratified by Guatemala and Uruguay. In 1881 the governments of the Central States issued invitations for a congress of American republics, to be held at Washington, D. C., in November, 1882, for the purpose of "considering and discussing the methods of preventing war between the nations of America," but, on account of the war between Chile, Bolivia, and Peru and the failure of Congress to make the necessary appropriations, the invitations were withdrawn. Finally on October 2, 1889, a congress representing every American republic except Santo Domingo met at Washington under the Presidency of Mr. Blaine. The congress remained in session till April 21st. Its work consisted of a number of recommendations, few of which were ever adopted by the governments interested. The principal of these related to the free navigation of American rivers, a uniform system of weights and measures throughout America, a uniform standard of value, and a common silver coin, an international banking system, uniform extradition treaties, reciprocity, uniform consular fees, harbor fees and regulations, uniform sanitary regulations, and the establishment of a Bureau of Information for the dissemination of intelligence concerning the commerce and resources of the American republics. In December, 1899, the Government of the United States suggested the holding of another congress, and upon the invitation of the Government of Mexico the City of Mexico was chosen for the place of meeting, and the date set was October 22, 1901. Eventually the governments of all the American republics accepted the invitation and the congress met on the date appointed. It was in session until January 31, 1902, a part of the time being spent in visiting places of interest in Mexico. The work of the

congress consisted of a number of protocols, treaties, conventions, resolutions, and recommendations. The more important of these were a protocol of adhesion to the Hague Convention for the settlement of international disputes; a treaty of compulsory arbitration signed by 10 delegations, and resolutions favoring construction of a pan-American railway; an international customs congress for international sanitation, collection, and publication of statistics relative to American trade and resources.

PAN-AMERICAN EXPOSITION. An exposition held in Buffalo, N. Y., from May 1, to November 2, 1901. It had for its purpose the illustration of the progress of civilization in the Western Hemisphere during the nineteenth century, and was originally planned for 1898, but the war with Spain intervened and the enterprise was deferred until 1901. A site in the northern part of Buffalo, covering an area of 350 acres and within three miles of the business centre of the city, was chosen. A formal ground plan introducing architecture, sculpture, and painting was early adopted, and it was agreed that the style of architecture should be a free adaptation of the Spanish Renaissance, that abrupt roofs with overhanging eaves should be used in preference to flat roofs with cornices and balustrades, that color and decorative sculpture should be introduced freely in the treatment of the buildings, and that the appearance of the exposition should be as gay and festive as possible. The buildings were arranged around a broad court having the form of an inverted T with its broad end to the south, where an approach was made over a triumphal causeway. From this on the east toward the north were the group of Government buildings, the Ethnology Building, the buildings of Manufactures and Liberal Arts, and Agriculture, while on the west side were the buildings of Electricity, Machinery, and Transportation, Temple of Music, and Horticulture, with its two wings, one of which was devoted to exhibits in graphic arts and the other to exhibits of mining. At the north end of the court thus formed, and balancing the Triumphal Causeway, was the Electric Tower. In addition to the foregoing, there were two permanent buildings, one of which, constructed of white marble and bricks, served as an art building, and is now the home of the Buffalo Fine Arts Academy, and the New York State Building, of white marble, which now contains the collections of the Buffalo Historical Society. The color scheme was designed and directed by Mr. C. Y. Turner, who chose as the underlying theme the fierce struggle of man to overcome the elements. Accordingly, the buildings on the east were arranged to represent man and his affairs, or that which man had gained after long years of strife with the elements, while those on the west represented the elements themselves. The struggle was denoted by heavy, deep coloring of red, blue, green, and gold, which graduated gently but firmly into tints, until the Electric Tower was reached, where the prevalent tone was a deep green, as near the color of Lake Erie as it was possible to attain. The tower, which had sculpture work on the four corners, itself was of a light ivory color, and was tinted with blue, green, and gold, which grew fainter as the top was reached, terminating in a gilt figure of the Goddess of Light. The color treatment gained for the Exposition the name of the Rainbow City, or the Tinted City. The sculpture was likewise harmonized with the general plan, and was under the direction of Mr. Karl Bitter. At the entrance of the Exposition, the Triumphal Causeway, which was perhaps the most ornate feature, represented the apotheosis of the United States, an allegorization of national pride, while the Electric Tower at the other end symbolized the great waters, suggesting that the importance, growth, and prosperity of Buffalo were due chiefly to the Great Lake system and waterways on which it was located. On the east side of the Esplanade the most conspicuous work was the Fountain of Man, by Mr. Charles Grady; while on the west side, which was devoted to Nature, there was placed the Fountain of Nature, by Mr. George Brewster. All of the sculpture was in white staff. The exhibits were examined by a jury of awards, and upward of 4000 awards of gold, silver, and bronze medals, and honorable mentions, were made. The total attendance was given as 8,179,674. The total cost of the Exposition was $8,860,757, and the total receipts were $5,534,643, leaving a deficit of $3,326,114. On September 6th President William McKinley (q.v.) was shot down by an assassin while holding a public reception in the Temple of Music, and he died eight days later at the house of John J. Milburn, the president of the Exposition.

PANARD, pȧ'närʹ, Charles François (1694-1765). A French song-writer, born at Courville, near Chartres. He went to Paris in early life, and was employed in the Government bureau for many years. Panard was an industrious writer of vaudeville and song, and his works in this line number more than eight hundred. His satire was never bitter, and his humor never coarse, while there was in all he wrote an insinuating grace and gayety. Marmontel gives an attractive picture of him in his *Mémoires*. Partial collections of his works were made under the titles *Théâtre et œuvres diverses* (1764) and *Œuvres choisies de Panard* (1803).

PANAS, pȧ'nä', Photinos (1832-1903). A French surgeon and ophthalmologist. He was born in Cephalonia, and studied medicine at Corfu and in Paris, where he was naturalized in 1863. After service in various other hospitals he became surgeon to the Hôtel Dieu in 1877. Two years afterwards he was appointed professor of clinical ophthalmology in the Ecole de Médecine. In general surgery Panas won some reputation by his services in the Franco-Prussian War, through his introduction of Lister's methods into France, and by his pioneer work as a successful operator in ovariotomy. But he was better known for his ophthalmological work, and it is in this field that he wrote: *Leçons sur le strabisme* (1873 and 1893); *Leçons sur les kératites* (1876); *Sur les affections de l'appareil lacrymal* (1877); *Anatomie pathologique de l'œil* (1879, with Remy); *Sur le glaucome et les néoplasmes intraoculaires* (1893); *Traité complet des maladies des yeux* (1894); and *Leçons de clinique ophthalmologique* (1899).

PAN'ATHENÆ'A (Lat. nom. pl., from Gk. Παναθήναια, *Panathēnaia*, from *πᾶς*, *pas*, all + Ἀθήνη, *Athēnē*, Athena). The most famous festival of Attica, celebrated at Athens in honor of Athena, patron goddess of the city. Two festivals were distinguished. The Lesser was annual,

and its origin was attributed to King Erichthonius, though Theseus was said to have changed the name from Athenæa to Panathenæa in commemoration of the union of the Attic communities into a single State. It was celebrated by a solemn procession to the Acropolis, a sacrifice and public feast, and was preceded by an evening torch-race. Probably gymnastic contests and chariot-races were also held. Like the Lesser, the Greater Panathenæa was held on the 28th of the first month of the Attic year, Hecatombæon (approximately July). Its establishment was attributed to the tyrant Pisistratus in B.C. 566. The celebration occurred in the third year of each Olympiad, and reached its culmination in the great procession which escorted to the Acropolis the sacred *peplus* of Athena. The *peplus* was a crocus-colored mantle, embroidered by chosen women of noble blood, with scenes from the contest of the gods and giants. At least as early as the end of the third century it was carried spread from the yard and mast of a ship on wheels. The procession included representatives of all the free population, the magistrates, old men with olive branches in their hands, maidens with the sacred utensils, the metics or resident foreigners with the vessels for the sacrifices, the cavalry, the chariots from the games, the animals for sacrifice, and all the other elements which were depicted by Phidias on the frieze of the Parthenon. The five days before the offering were filled with contests of various kinds. Rhapsodists contended in recitations of the epic poems, and there were also musical contests. There were prizes for pyrrhic and cyclic choruses and the ten tribes presented in competition bands of old men chosen for their beauty and strength. There were the usual athletic contests for boys, youths, and grown men, seemingly in great numbers, but the chief feature of these games was the number of the horse-races, which included, not merely the usual chariot-races with spans and four horses, but also a special variety, in which each chariot contained, besides the driver, an armed runner, who, as the chariot crossed the finish line, sprang from the moving car and ran back the length of the stadium. The last contest was a race of triremes off the Piræus. For the musical contests the prizes were crowns of gold and silver and money, for the choruses an ox for sacrifice, and for the athletic games vases filled with oil from the sacred olive-trees. Many of these vases have been found, all similar in style, showing on one side Athena brandishing her lance, between two columns, and on the other a scene from the sport for which the vase was a prize. Consult: Michaelis, *Der Parthenon* (Leipzig, 1871); Mommsen, *Feste der Stadt Athen im Alterthum* (ib., 1898).

PANAX. A genus of plants. See ARALIA; GINSENG.

PANAY, pä-nī'. One of the Philippine Islands, the westernmost of the Visayan group. It lies nearly in the geographical centre of the archipelago, and is bounded on the north by the Visayan Sea, on the east and southeast by the Strait of Guimarās, from 9 to 56 miles wide, separating Panay from Negros, and on the west by the arm of the Sulu Sea known as the Mindoro Sea, which on the northwest separates Panay from Mindoro (Map: Philippine Islands, G 8).

Panay ranks fifth in size among the Philippine Islands. Its area is 4752 square miles, and with the 118 dependent islands, 5103 square miles, the mainland being thus somewhat larger than the island of Corsica. It is broadly triangular in shape. Its southern and western coasts are very little indented, and afford no harbors except open roadsteads. On the northeast and east coasts, however, there are numerous small bays and sounds with anchorages, sheltered by the adjacent islets. The best harbor is at Hoilo, on the strait of that name separating the island of Guimarās from the mainland. Guimarās, the principal dependent island of Panay, has an area of 243 square miles, and lies in the narrowest part of the channel between Panay and Negros.

The centre of Panay is the nucleus of its mountain system, which consists of three principal mountain ranges radiating from that point to the three corners of the triangular island. These ranges divide the island politically into its three provinces, and hydrographically into its three main drainage basins, that of the Panay River in the north, the Jalaur in the southeast, and the Cadiān in the west. These dividing ranges are very rugged and almost insurmountable. They have a number of peaks exceeding 3000 and 4000 feet, several above 5000, and Mount Madiaās in the northwestern range has a height of 7264 feet. In each of the three basins the land descends gradually to the sea. The southeastern slope is gently undulating, while the western and northern are more rugged, with a number of outlying peaks. Extensive forests cover the uplands, and the lower slopes, especially in the southeast, have a pleasant park-like aspect. The soil is everywhere fertile and well watered; besides the three rivers mentioned there are many smaller streams flowing through every part of the island. For climate and natural history, see the article on the PHILIPPINE ISLANDS.

As in the rest of the archipelago, the chief occupation is agriculture, and the staple products are rice, sugar, and copra. The shipment of sugar through the port of Hoilo in 1899 amounted to 77,641 tons, and that of copra to 636 tons. Under ordinary conditions, however, as shown by the figures for 1892 (177,467 tons of sugar), the export will be more than twice as great. Other agricultural products are cotton, hemp, corn, coffee, tobacco, cacao, indigo, and pepper. There are large areas of fine grazing land in Panay, especially in Hoilo Province. Before the war with Spain there were more than 200,000 head of live stock on the island, consisting chiefly of carabaos, sheep, and horses, the latter being highly prized throughout the archipelago. The mineral wealth has not yet been exploited, but there are known to be deposits of iron, gypsum, coal, and marble, while gold has been found in various localities. The manufacturing industry yields products in sufficient quantity for export. There are numerous looms in operation producing fabrics of pineapple fibre, jusi, sinamay, silk, cotton, and hemp. Coasting trade and commerce with the rest of the archipelago through the port of Hoilo are also very active.

The natives of Panay offered a spirited resistance to the authority of the United States from the beginning of the insurrection. The town of

Iloilo was occupied and garrisoned by United States troops on February 11, 1899, but the insurgents practically held the whole interior of the island until the beginning of active operations after the fall of 1900. The insurgents were then dispersed and driven to the mountains after a number of sharp engagements. The surrender of General Delgado in January, 1901, followed by that of other influential leaders, practically accomplished the pacification of the island, and on April 13, 1901, civil government was inaugurated. Under the Spanish rule the island was divided into the three provinces of Antique in the west, Cápiz in the north, and Iloilo in the southeast, and the Commandancia of Concepción in the northeast. The last is now incorporated with the Province of Iloilo. The population of Antique was estimated in 1901 at 115,434, that of Cápiz at 224,000, and of Iloilo 464,444, giving a total for the whole island of 801,878. The inhabitants are nearly all Visayans, there being only a few thousand savage Mundos and Negritos in the mountains. The capitals are San José de Buenavista (q.v.) in Antique and Cápiz (q.v.) and Iloilo (q.v.) in the provinces of those names.

PANAY. A town of Panay, Philippines, in the Province of Cápiz, situated about three miles southeast of Cápiz (Map: Philippine Islands, G 8). Population, 15,500.

PANCATANTRA, or **PANCHATANTRA**, pän'chä-tän'trä (Skt., five threads, or books). The most important collection of Sanskrit beast-fables. Its date is uncertain, but is probably as old as the fifth century A.D., since it was translated into Pahlavi in the sixth century by Barzoi, the Court physician of the Sassanian King Khosru Anushirvan (531-579). The Pancatantra is almost certainly drawn from Buddhistic sources. Its analogies with the Jatakas (q.v.), or birth stories of the Buddha, are too close to admit of any other explanation than direct borrowing. Thus the mingling of maxims in verse with the prose story and the similarity of the beast-fables of the Sanskrit work to many of the *jataka* tales are resemblances both striking and significant. On the other hand, the original Buddhism of the Pancatantra has been modified and given a veneer of Brahmanism by the later redactors of the collection, who exercised whatever was anti-Brahmanistic in spirit. The outline of the collection is a simple one. Amaraśakti, King of Mahilaropya, a city of the south (perhaps the Maliarpha of Ptolemy, and the modern Mayilapur near Madras), had three idle and stupid sons. On the advice of his minister Sumati, he requested an aged Brahman, Vishnuśarman, to teach these youths and make them princes indeed. The sage promised to achieve this result within six months, and, to inculcate in them moral principles, he wrote the Pancatantra. After the young men had read this work, they became, within the six months' space, all that Amaraśakti could desire. The Pancatantra itself is divided, as its name implies, into five books. The first of these, the *Mitrabhēda* or *Separation of Friends*, tells how two jackals, Karataka and Damanaka (whence is derived the title of the Syriac version, Kalila and Dimna), bring together a lion, Pingalaka, and a bull, Sanjivaka. Damanaka, however, soon feels himself neglected, and, by telling the lion and the bull alike that each is plotting against the other, he causes the death of both, and, as the lion's prime minister, becomes the gainer by his craft. The second book, called the *Mitraprāptika*, or *Acquisition of Friends*, deals with the friendship of a crow, Laghupatanaka, a mouse, Hiranyaka, a tortoise, Mantharaka, and a deer, Citranga, and sets forth the value and advantage of true friendship. The third book, the *Kōkōlūkiya*, or *(Book of) the Crows and Owls*, is designed to show the impossibility of real friendship between those who are natural enemies, as were Meghavarna, king of the crows, and Arimardana, king of the owls. In the fourth book, entitled *Labdhapranāśa*, or *Loss of what has been Gained*, the main story is of a crocodile, Vikaralamukha, and a monkey, Raktamukha. The latter gave the former nuts of the rose-apple tree, which so delighted the crocodile's wife, when she tasted some, that she compelled her husband to seek the heart of the monkey, which must be, she thought, better even than the nuts. Raktamukha, however, escaped, and the crocodiles for their greed and ingratitude lost all chance of future dainties. The last book is named *Aparīkṣitakāraka*, or *Thoughtless Action*. A certain pious merchant named Manibhadra, who had lost all, had a vision in which he was bidden to strike a Jaina monk who should appear to him the following day. He did as he was bidden, and the apparition turned into gold. A barber seeing this, and knowing nothing of the vision, invited a number of Jaina monks to his house, and struck them so severely that many were killed, and the barber himself was impaled as a punishment for his folly. About these frameworks fables appropriate to the title of each book are built. After the introduction, the order is a box arrangement, familiar to readers of the *Arabian Nights*. The situations are often excellent, and the moral teaching beyond reproach. The quaint treatment of the beasts as men, yet retaining all their peculiar traits, has a touch of delicate humor. Thus the crocodile falls at his wife's feet, and the tiger stands with folded hands after performing his religious ablutions. The influence of the Pancatantra on literature has been considerable, as from it, in large part, the Hitopadesa (q.v.) was taken, and its form very probably exercised an influence, at least remotely, on the *Arabian Nights* (q.v.). The text of the work, which seems from the evidence of the oldest translation to have comprised twelve books instead of five as at present, varies considerably in the different recensions. Consult: *Pantchatantrum*, ed. Kosegarten (Bonn, 1848-59); *Panchatantra*, ed. Kielhorn and Bühler (Bombay, 1885-96); Benfey, *Pantschatantra, übersetzt mit Einleitung und Anmerkungen* (Leipzig, 1859); Lancereau, *Pantchatantra, traduit* (Paris, 1871); Fritze, *Pantschatantra, neu übersetzt* (Leipzig, 1884); Shadagopa Chari, *Panchatantra*, translated (Trichinopoli, 1887); Mankowski, *Der Auszug aus dem Pañcatantra in Kshemendras Brihatkathamanjarī* (Leipzig, 1892); Schmidt, *Pañcatantra (Textus ornatior), zum ersten Male übersetzt* (ib., 1901). See BIDPAI; FABLE.

PANCHALA, pän-chä'lä. The name of a country in ancient India. It was one of the two great divisions of the so-called Madhyadeśa, or Midland Country. Its territory lay between the Ganges and the Jumna, and extended nearly from Bulandshahr to Allahabad, although at one

time it extended over the wider district which lies between the Chambal River and Gangadvara.

PAN'COAST, Joseph (1805-82). An American surgeon, born in Burlington County, N. J. He graduated from the medical department of the University of Pennsylvania in 1828, and in 1834 was appointed a physician at the Philadelphia Hospital. Four years later he accepted the professorship of surgery in Jefferson Medical College, a chair which in 1841 he exchanged for that of anatomy. The latter he held until 1878, when he resigned in favor of his son, Dr. William Henry Pancoast, and was elected emeritus professor. After leaving his position at the Philadelphia Hospital he was until 1845 one of its visiting surgeons, and later (1854-64) held a similar position at the Pennsylvania Hospital. He originated several important operations, and published a number of medical and surgical works, among which are: *A Treatise on Operative Surgery* (3d ed. 1852); *A Treatise on the Structure, Functions, and Diseases of the Human Sympathetic Nerve* (1831), a translation of Lobstein's Latin original; and *A System of Anatomy for the Use of Students* (1844), adopted from Caspar Wistar. In addition he contributed frequently to the *American Journal of the Medical Sciences* and to the *American Medical Intelligencer*.

PANCRAS, or **PANCRATIUS.** A Christian martyr, who suffered death at Rome at the early age of fourteen years, during the Diocletian persecution. He was highly honored during the Middle Ages and considered to be the avenger of false oaths. The French kings at one time confirmed their treaties by swearing in his name. His day is May 12th, the date of his martyrdom.

PANCRATIUM (Lat., from Gk. παγκράτιον, *pankration*, complete contest, from παγκρατής, *pankratēs*, all-powerful, from πᾶς, *pas*, all + κράτος, *kratos*, strength). A form of Greek athletics, combining wrestling and boxing, the invention of which was ascribed to Theseus. The bare hands were used, and were curved, but not clenched, in boxing. It formed part of the great national games of Greece, and became very popular at Rome, where it appears to have been introduced in Caligula's time.

PANCREAS (Neo-Lat., from Gk. πάγκρεας, *pankreas*, sweetbread, from πᾶς, *pas*, all + κρέας, *kreas*, flesh). A compound racemose gland, found lying transversely across the posterior wall of the abdomen behind the stomach, varying in length from six to eight inches, having a breadth of about an inch and a half, and a thickness of from half an inch to an inch. Its usual weight is about three ounces. The large expanded end of the pancreas directed to the right is known as the head, the smaller pointed extremity extending to the left is known as the tail. The head of the pancreas lies in the concavity of the duodenum.

The secretion of this gland, or the pancreatic fluid, is conveyed from its various parts by means of the pancreatic duct to the duodenum. This gland is found in all mammals, birds, reptiles, amphibians, and osseous fishes, and in some cartilaginous fishes.

For the character and function of the pancreatic fluid, see Digestion, Organs and Process of.

The diseases to which the pancreas is subject, though few, are usually of a fatal character. Their existence is often not made manifest by any very well recognized set of symptoms, so that a diagnosis of the affection is frequently impossible. Wounds of this organ are usually fatal.

PANCREATIN. A mixture of the ferments naturally existing in the pancreas of warm-blooded animals, and usually obtained from the fresh pancreas of the hog. The animal should be killed about six hours after a full meal, the organ being then at the height of its activity. The extract is a yellowish, yellowish white, or grayish amorphous powder, having a faint, peculiar odor and a meaty taste. It contains or should contain the four pancreatic enzymes or ferments: trypsin, which has the property of digesting proteids (meat, eggs, etc.); amylopsin, a diastatic ferment, i.e. converts starches into sugars; steapsin, a fat-splitting and emulsifying ferment; and a milk-curdling enzyme. It is used as an artificial agent to digest the food of invalids and old people, or those prostrated by fever or exhaustion.

PANCSOVA, pōn'chō-vō. A royal free city in the County of Torontál, South Hungary, situated on the Temes a few miles from its confluence with the Danube, and about 10 miles northeast of Belgrade (Map: Hungary, G 4). It is a well-built town with a number of squares, fine public buildings, a gymnasium, and a custom-house. Its manufactures include silk, liquors, brick, and flour. The trade in grain is important. Population, in 1890, 18,289; in 1900, 19,044, chiefly Serbs, Magyars, and Germans.

PAN'DA (perhaps an abbreviation of Naipali *nigalyaponga*, bamboo-eater), or Wah. A curious Himalayan mammal (*Ursus* (*Ailurus*) *fulgens*), of the raccoon family, and much like a raccoon in habits. It is about the size of a house-cat, and has a very short muzzle, small rounded ears, a moderately long tail, covered with long hair, plantigrade feet with semi-retractile claws, and a singular dentition. It dwells chiefly among the rocks of the higher mountain slopes, but also climbs trees, and preys much on birds, small quadrupeds, and insects. It has a thick, fine, woolly covering, adapting it to a cold climate, concealed by long, soft, glistening and richly colored hair, mostly chestnut brown, which passes into black on the sides and legs, and into white on the head. The panda is also called *wah* and *chit-wa*, from a peculiar cry which it utters. It is restricted to the southeastern Himalayas, where these animals are occasionally captured and tamed into gentle but inactive pets. An extinct panda lived in Europe during the Pliocene period. Consult Lydekker, *Royal Natural History*, vol. ii. (London, 1896).

PANDAN, pän-dän'. A seaport town of Panay, Philippines, situated on the west coast of the island, in the northern part of the Province of Antique (Map: Philippine Islands, G 5). Population, 13,737.

PAN'DANA'CEÆ, the Pandanus, or Screw-Pine, Family (Neo-Lat. nom. pl., from *Pandanus*, from Malay *pandang*, conspicuous). A natural order of monocotyledonous plants, constituting a remarkable feature in the scenery of many tropical countries, where they frequent the seacoast or marshes. They are trees or shrubs, sometimes decumbent or climbing, and often sending down adventitious roots, which bear curious membranous rootcaps. The order is composed of the genera Pandanus and Freycinetia, which have

long, simple, imbricated leaves, usually spiny on the back and margin, their base embracing the stem, their spiral arrangement often notably visible. The flowers are mostly unisexual, naked, or with only a few scales, arranged on a spadix and wholly covering it. The stems are numerous; the ovaries usually clustered, one-celled, each crowned with a stigma; the fruit consists of fibrous, one-seeded drupes, collected or almost combined, or of berries with many seeds. There are about 80 known species, some of which yield useful products.

PANDANUS. See SCREW-PINE; PANDANACEÆ.

PAN'DARUS (Lat., from Gk. Πάνδαρος, *Pandaros*). (1) The son of Lycaon and a hero of the Trojan War. With the bow received from Apollo, he became famous as an archer. He was killed by Diomedes. (2) One of the companions of Æneas, killed by Turnus. (3) In Shakespeare's *Troilus and Cressida*, and in Chaucer, a go-between or procurer; the uncle of Cressida.

PĀṆḌAVAS, pän'dȧ-vȧz. In Hindu legend, the five putative sons of Pandu, the son of the sage Vyasa (q.v.). As he was prevented by a curse laid on him by a sage, whom he had unwittingly killed, from having offspring, his two wives, Kunti and Madri, by a charm obtained from the sage Durvasas, were permitted to bear children by any divinities they chose to invoke. Kunti accordingly bore three of the Pandavas, Yudhishthira, Bhima, and Arjuna, by Dharma, Vayu, and Indra respectively, while Madri gave birth to the other two, Nakula and Sahadeva, by the twin Aśvins. Arjuna is by far the noblest of the brothers, and is the real hero of the epic of the Mahabharata. It is he to whom Krishna recites the Bhagavad-gita (q.v.) on the eve of the battle of Kurukshetra. Next to him in uprightness stands Yudhishthira, while Bhima, although gifted with many good qualities, is boastful and irascible, conspicuous for physical rather than moral courage. The two sons of Madri play but a subordinate part. The strife between the Pandavas and their cousins the Kauravas, the hundred sons of Dhritarashtra, the blind brother of Pandu, is the theme of the great Sanskrit epic of the Mahabharata (q.v.). The legend seems to be a reflex of an early tribal war in Northern India.

PANDECTS (Lat. *pandecta*, from Gk. πανδέκτης, *pandektēs*, all-receiving, from πᾶς, *pas*, all + δέχεσθαι, *dechesthai*, to receive). The leading compilation of the Roman law, made by the direction of the Emperor Justinian (q.v.). It is also sometimes known as the Digest. The celebrated Justinian Code had previously been compiled by his order, but it dealt with the more practical affairs of common occurrence, and the Pandects were designed to supplement it with all the more subtle legal learning of the age.

In A.D. 530 Justinian, by an ordinance known as the *De Conceptione Digestorum*, commanded the eminent jurist Tribonianus to select some of the most learned lawyers and jurisconsults of the Empire to assist him in making a collection of decisions and opinions on all points of law. Tribonianus, who had previously had valuable experience in the preparation of the code, formed a commission consisting of himself and sixteen others for the purpose. The work was finished in the year 533, three years after it was commenced. The authorities which were compressed, interpreted, and put in systematic form were said to have consisted of upward of 2000 treatises, and the Pandects contain upward of 9000 separate extracts or statements, selected according to subjects from these treatises and authorities.

The Pandects are divided into 50 books, each containing several titles, and each title several extracts from the authorities, due credit being given to the lawyer or authority from which each extract is derived. The usual form of citation is by the numbers of the book, title, and section or extract. The work is also divided into seven parts, which correspond respectively with the books, 1-4, 5-11, 12-19, 20-27, 28-35, 36-44, and 45-50. This latter division is seldom referred to in citations.

The principal jurists from whose writings the extracts were taken were 39 in number, and are sometimes called the classical jurists, although some eminent writers confine that name to five of that number, viz. Papinianus Paulus, Ulpian, Gaius, and Modestinus. The extracts from these authorities indeed constitute the bulk of the collection, those from Ulpian alone making about one-third of the whole work, those from Paulus one-sixth, and those from Papinianus one-twelfth. Other writers besides these 39 are cited, but usually only indirectly, i.e. when cited by the jurists whose works constitute the basis of the collection. The Pandects were arranged according to the method of the code.

The work is deservedly one of the most famous collections of law the world has known. In its relations to the history and literature of Rome it is invaluable; and with its necessary complement, the Codex, it was the basis of all mediæval legislation, and of the civil law of today, besides exercising an influence on the law of England. The origin of many doctrines and terms in modern English and American law may be traced to the Pandects, and the idea of codification which prompted the work is being developed in all jurisdictions in general acts on various subjects of the law. See JUSTINIAN; CIVIL LAW; COMMON LAW; JURISCONSULT.

PAN'DER, CHRISTIAN HEINRICH (1794-1865). A Russian naturalist, one of the founders of embryology. He was born in Riga, studied in Germany at Würzburg and Jena, and in 1820 accompanied, as naturalist, a Russian expedition to Bokhara. His great contribution to the embryology of the Vertebrata was in the study of the development of the chick, and in 1817 he made careful research on the embryonic layers which, although known to Wolff half a century before, are commonly called by Pander's name, as is the kernel or central swelling on the germinal disk of the fowl's egg. Besides *Beiträge zur Entwickelungsgeschichte des Hühnchens im Ei* (1817), and a Latin dissertation on the changes in the egg in the first five days of incubation (1817), Pander wrote *Vergleichende Osteologie* (with D'Alton, 1820-28) and *Beiträge zur Geognosie des russischen Reichs* (1830).

PANDO'RA (Lat., from Gk. Πανδώρα, giver of all, also interpreted as gift of all, or gifted by all, i.e. the gods, from πᾶς, *pas*, all + δῶρον, *dōron*, gift). According to the Hesiodic poems, the first woman. To punish Prometheus

and mankind for the theft of fire, at the command of Zeus, Hephæstus formed from earth a beautiful woman, to whom all the gods contributed gifts. She was sent by the gods to Epimetheus, the brother of Prometheus, who, in spite of warnings, received her to his ruin. One version adds that Pandora opened a cask in which were kept safe many blessings, which thus became scattered and lost, only Hope being saved by the prompt closing of the lid. There are many indications that point to Pandora as an earth-goddess like Demeter, and render it probable that the original myth is of a new earth given to men as punishment for the theft of fire, from which sustenance can only be won by hard toil. The "Birth of Pandora" was represented on the base of the great statue of Athene Parthenos by Phidias, and is found on two Attic vases and two reliefs.

PANDORUS SPHINX. A large olive-brown North American hawk-moth (*Philampelus Pandorus*). See Colored Plate of MOTHS.

PANDROSOS (Gk. Πάνδροσος, all-bedewing). The daughter of the Athenian Cecrops. She was the first priestess of Athena, and with the latter was honored in the Pandroseum on the Athenian Acropolis.

PĀNDYA, pän'dyä. A country in the extreme south of ancient India, corresponding roughly to the modern Tinnevelli. Its western boundary was the famous Malaya Mountain (the southern part of the Western Ghats), and its southern the Tambraparni River. The sacred island of Rameswaram, from which Rama (see RĀMĀYANA) began his bridge to Ceylon, was also a part of Pandya. The capital was almost certainly Madhura (now Madura), although Kalidasa (q.v.) calls the chief town 'Serpent City,' which might seem to point to Negapatam, situated on the coast, a little south of Karikal. The Kingdom of Pandya was well known to Ptolemy, Strabo, and Pliny, who call it Pandion, and according to some classical accounts the King sent an embassy to the Emperor Augustus.

PANEL (OF. *panel, pannel, pancau*, Fr. *panneau*, from ML. *panellus*, panel, diminutive of Lat. *pannus*, cloth, rag, Gk. πῆνος, *pēnos*, Doric πᾶνος, *panos*, thread on the bobbin). Primarily, a flat piece of wood engaged by its edges into the grooves of a frame surrounding it; hence, by extension, any flat surface surrounded by a frame. In carpentry and joinery the frame may be plain or molded, and the flat and relatively thin board may be set with its face flush with one face of the frame (*flush* panel); or it may have the central part of its surface project more than the portions next the frame (*raised* panel); or be itself decorated with moldings or carvings (*molded* panel, *carved* panel). In architecture any space defined by inclosing moldings or framework is called a panel. The deep panels of vaults like those of the Pantheon and many Renaissance ceilings, are called *caissons* or coffers; small round panels are called *medallions*. In Gothic architecture paneling was often adorned with carved tracery, and in the late or florid period large wall surfaces were covered with paneling itself reproducing tracery-forms, as in Henry VII.'s chapel at Westminster. Wherever woodwork is used for large surfaces, it is commonly paneled, as in doors, wainscoting, and furniture.

PANEL. A schedule or list of the names of persons whom a sheriff, or other proper officer of the court, has summoned to serve as jurors.

The term is also applied to the body of persons in attendance upon a court in response to a summons to appear and serve as jurors.

In the Scotch law the term panel is employed as being synonymous with the English phrase 'prisoner at the bar.' See JURY; TALESMEN; VENIRE FACIAS.

PANGANI, pän-gä'nē. A coast town of German East Africa, at the mouth of the river Pangani, 50 miles northwest of Zanzibar (Map: Africa, H 5). The town is the seat of a government district, with a custom house, post-office, and telegraph agency. There are a mosque and some stone houses, but most of the houses are of clay. It has the building of the German East Africa Company and is the chief export point of the colony, with an extensive inland caravan trade. Population, estimated, 6000, mostly negroes and Arabs.

PANGASINÁN, pän'gä-sē-nän'. A province of Western Luzon, Philippine Islands, situated at the head of the Gulf of Lingayén (Map: Philippine Islands, E 3). Its area is 1316 square miles. It is bordered by mountains on the east and west, but practically the whole province is occupied by the lower valley and the delta of the Agno River. A large part of the coast region is subject to inundations, and even the rice, the staple crop, is sometimes injured by the floods. Other agricultural products are sugar-cane, corn, tobacco, and cocoanuts, and there are abundant deposits of salt and other minerals. The chief industry is the weaving of buri, which is made into mats, hats, and sugar sacks. There is an active commerce in the hands of the Chinese. The population was estimated in 1901 at 302,178, chiefly Pangasinán. The capital is Lingayén (q.v.).

PAN'GE LIN'GUA (Lat., Proclaim, O Tongue). One of the most remarkable of the hymns of the Roman breviary, and like its kindred hymn, *Lauda Sion*, a most characteristic example as well of the mediæval Latin versification as of that union of theology with asceticism which a large class of these hymns present. The Pange Lingua is a hymn in honor of the eucharist, and belongs to the service of the festival of Corpus Christi. It was written by Saint Thomas Aquinas (q.v.) in 1263 and consists of six strophes of verses in alternate rhyme. Besides its place in the office of the breviary, the last two stanzas form part of the service of benediction of the blessed sacrament.

PANGEN'ESIS (Neo-Lat., from Gk. πᾶς, *pas*, all + γένεσις, *genesis*, production, from γίγνεσθαι, *gignesthai*, to be born). The name given to a theory proposed by Darwin, to account for the facts of heredity. He conceived that the hereditary characters of all organisms were handed down by means of exceedingly minute gemmules thrown off from the individual cells of the body. These invisible granules or gemmules, too minute to be detected by the microscope, were supposed by Darwin to be the bearers of heredity (q.v.). These gemmules were supposed to multiply by self-division and to find their way by various routes to the developing reproductive cells, in which they would accumulate until each reproductive cell contained gemmules represent-

ing every part of the body; each gemmule was supposed to develop into the part corresponding to that from which it was derived. This theory was disproved by Galton by experimenting on the transfusion of blood from rabbits of one breed to those of another, and finding that the results proved that "the doctrine of pangenesis, pure and simple, is incorrect." Consult: Darwin, *The Variation of Animals and Plants Under Domestication*, vol. ii. (London, 1888); Brooks, *The Law of Heredity* (Baltimore, 1883); Weismann, *Essays upon Heredity* (Oxford, 1889).

PANGLOSS, Doctor. A pompous prig in Coleman's *Heir-at-Law*, the tutor of Dick Dowlas. He is given to affected expressions and to quotations, to which he always adds the source.

PANG'OLIN. A name for the East Indian scaly ant-eaters of the family Manidæ. See Manis.

PANHANDLE. A name given to the portion of West Virginia which protrudes between Ohio and Pennsylvania, and to similar projections of Texas and Idaho.

PAN'HELLE'NIA. A festival of Zeus Panhellenios instituted by the Emperor Hadrian, who also bore the surname Panhellenios.

PANIC. See Crisis, Economic.

PANICALE, pä'nē-kä'lā, Masolino da. See Masolino da Panicale.

PANICLE (from Lat. *panicula*, diminutive of *panus*, from Doric Gk. *πᾶνος*, *panos*, thread on the bobbin). A compound, spray-like flower-cluster produced by the branching of a raceme or corymb, as in many grasses. See Inflorescence.

PANICUM. A genus of grasses. See Millet.

PĀNINI, pä'nē-nē (fourth century B.C.). The greatest of all the grammarians of India. Of his life very little is known. Combined evidence fixes his birthplace at Salatura, near the modern town of Attock, in the extreme north of the Punjab. According to a verse in the Pancatantra (q.v.) he was killed by a lion. A late and trivial legend, told by Somadeva in the *Kathāsaritsāgara*, describes the future grammarian in his youth as a very stupid pupil of a Brahman named Varsha. Being sent away, Panini practiced such austerities in the Himalayas that Siva, pleased with the penance, revealed to him the grammar which he then set forth to the world. The work of Panini is the oldest Sanskrit grammar which has been preserved. Although he names no less than sixty-four predecessors in two schools, a northern and a southern, their books have been so entirely superseded by his that they have disappeared. He marks the line between Vedic and classical Sanskrit. (See Sanskrit Language.) His influence is shown by the fact that the language as he fixed it never changed its character so far as the literary usage was concerned. The grammar of Panini consists of eight books, each of which contains four chapters. The chapters are composed of varying numbers of extremely short rules, or *sūtras*, of which the entire work contains 3996. Of these three, or perhaps four, were not written by Panini himself. The rules are in algebraic style, and are so compact and obscure that they are unintelligible without close study. He invented a large number of arbitrary symbols to express various grammatical terms, which increase the obscurity of his work, even while they contribute in a large measure to its brevity. There is, however, a certain amount of method beneath these apparently arbitrary symbols. His system of grammar is based on the theory of the verbal origin of nouns. The arrangement is widely different from that found in Occidental works. Thus instead of treating phonology, inflection, conjugation, and the like separately, Panini traces a given phonetic change, as the change of *a* to *ā*, throughout the language, without reference to the class of word in which it may occur. Syntax is not considered by him, and the inflection, strictly speaking, must be built up from the rules scattered throughout the work. The authority gained by Panini was well deserved, for his grammar is one of the most exhaustive ever written. This preëminence, together with his extreme obscurity, has called forth a number of commentaries. Of these the most important were the *Mahābhāṣya*, or Great Commentary, of Patañjali (q.v.), probably in the second century B.C. (edited by Kielhorn, 3 vols., Bombay, 1878-85), in which previous commentaries were summarized, and the first complete one, the *Kāśikā Vṛtti*, or Benares Commentary, of Jayaditya and Vamana, about A.D. 650 (edited by Bala Sastri, Benares, 1898). To the grammar there are added as appendixes a *Dhātupāṭha*, or Index of Roots, and the *Gaṇapāṭha*, or Index of Classes, both ascribed to Panini. The first contains 1961 roots, of which only about eight hundred have thus far been found in Sanskrit, although comparative linguistics establishes the existence of a number besides. About fifty roots known to occur in the Vedas are omitted. The second appendix is a collection of lists of words following the same rule as the first one of their series which is given in the main grammar. The chief edition is that by Böhtlingk, *Pāninis Grammatik* (Leipzig, 1887).

PANINI, pä-nē'nē, Giovanni Paolo (c.1695-1764). An Italian painter, born at Piacenza. He was the pupil of Benedetto Luti and Andrea Lucatelli, in Rome. He confined his attention to interiors and exteriors of buildings in or about Rome, and introduced figures and accessories, which, while not archæologically accurate, are very picturesque in arrangement. His works include: "Interior of Saint Peter's," and "Antique Ruins," in the Louvre; "Ancient Ruins with Figures," in the National Gallery, London; and "Cardinal Polignac Visiting the Interior of Saint Peter's," in the Metropolitan Museum of Art, New York City.

PANIPAT, or **PANIPUT**, pän'ē-pūt'. A town in the District of Karnal, Punjab, British India, situated near the old bank of the Jumna, 53 miles north of Delhi by rail (Map: India, C 3). It figured in the negotiations between Yudishthira and Duryodhana about B.C. 1100. As an outpost of Delhi on the military road between Afghanistan and the Punjab it was the scene of several battles prominent in the history of Upper India. The most important are the battle of 1526, when the Afghan forces of Ibrahim Lodi, Emperor of Delhi, were routed by an inferior force of Moguls under Baber, who occupied Delhi and became Emperor; that of 1556, when Akbar, the grandson of Baber, won a vic-

tory over the Afghans under the Hindu general Hemu; and that of 1761, when the united armies of the Mahratta chieftains were defeated by the Afghans under Ahmad Shah Durani. At present the town is of little importance, and squalid in appearance. Population, in 1891, 27,547; in 1901, 26,914.

PANITAN, pä-nē'tän. A town of Panay, Philippines, in the Province of Cápiz, situated on the Panay River, six miles south of Cápiz (Map: Philippine Islands, G 8). Population, 10,020.

PANIZZA, pä-nēt'sä, Oskar (1853—). A German satirist. He was born at Kissingen, studied medicine at Munich, where he was physician to an insane asylum from 1881 to 1883, and then lived in Paris and London. His early publications were lyrics, *Londoner Lieder* appearing in 1887. But he is better known for his satirical writings. Among them *Die unbefleckte Empfangnis der Päpste* (1893), *Der deutsche Michel und der römische Papst* (1894), and *Abschied von München* (1896) were suppressed by the German Government. The last mentioned refers to Panizza's condemnation to a year's imprisonment for blasphemy in his tragedy *Das Liebeskonzil* (1895; 3d ed. 1897). After his departure from Munich he lived in Zurich, and then in Paris as editor of the *Züricher Diskussionen*, and wrote *Dialoge im Geiste Huttens* (1897), *Psychopathia Criminalis* (1898), and *Parisiana* (1899).

PANIZZI, pä-nēt'sē, Sir Antonio (1797-1879). Principal librarian of the British Museum from 1856 to 1866. He was born September 16, 1797, at Brescello, in the Duchy of Modena. He studied at the University of Parma, graduating in the faculty of law in 1818. He practiced in his birthplace. In 1828, despite favors from the Duke of Modena, he became involved in the conspiracy to overthrow the Modenese Government, and was arrested, but he escaped to England. Under the patronage of William Roscoe, the historian, he taught Italian at Liverpool. In 1828 Lord Brougham got him the Italian professorship at University College, London, and in 1831 the post of assistant librarian in the British Museum. In 1837 Panizzi was made keeper of the printed books, and in 1856 he succeeded Sir Henry Ellis (q.v.) as principal librarian. He resigned in 1866. He was made K. C. B. in 1869. Panizzi died at his London home near the Museum, April 8, 1879.

Panizzi was a man of immense energy and capacity. A friend of the leading statesmen of the time, in England, France, and Italy, he continued to wield political influence down to his death. Panizzi really made over the British Museum. Under his direction the library was removed from Montague House to its present quarters. He designed the famous reading room and its annexes, perhaps his most brilliant conception. He framed the catalogue rules. He obtained for the library the princely bequest of Thomas Grenville, consisting of more than 20,000 rare volumes, valued at £54,000. In 1843 he drew up an elaborate report of the deficiencies in the library, which led two years later to an annual grant from the Government of £10,000 for the purchase of books. This fund, still continued, has helped to make the library the richest in the world. Panizzi wrote for the magazines, and edited Boiardo's *Orlando innamorato*, Ariosto's *Orlando furioso* (1830-31), and Lord Vernon's reprint of the first four editions of *The Divine Comedy* (1858). Consult Louis Fagan, *Life of Panizzi* (London, 1880).

PANJAB, pun-jäb'. A province of British India. See Punjab.

PANJABI (pŭn-jä'bē) **LANGUAGE AND LITERATURE**. The modern Indian language and literature of the Punjab (q.v.). The Panjabi represents, roughly speaking, an archaic dialect of Hindi, supplemented by a large number of loan-words from Arabic and Persian. On the other hand, the infusion of Sanskrit loan-words (technically called *tatsama*, 'identical') is small, as compared with the Eastern languages of India, especially Bengali (q.v.) and Uriya (q.v.). Panjabi, like all the Indian languages, has many small sub-dialects, which shade off into each other. The chief of these dialects are Multani in the South, which stands intermediate between Panjabi and Sindhi (q.v.), Jathki in the Centre, and Chibhali Dogri in the North. There are several alphabets. Of these the oldest is the Gurmukhi, a modification of the Sanskrit Devanagari alphabet, with the omission of the signs for *r*, *ē*, *l*, *l*, *s*, and *kh*, but with the addition of *r* and *l*. It is in the Gurmukhi script that the Adi Granth (q.v.) of the Sikhs is written. Next to the Gurmukhi the Lundi, which is employed by the merchant class, deserves mention. The official character of the Government, however, is the Arabic, which is the one most generally employed. Panjabi has practically no literature, excepting the Sikh Granths, although the New Testament and parts of the Old Testament have been translated into Multani and Dogri.

Consult: Cust, *Modern Languages of the East Indies* (London, 1878); Beames, *Comparative Grammar of the Modern Aryan Languages of India* (ib., 1872-89); Tisdall, *Panjabi Grammar and Reading Book* (ib., 1889); Wilson, *Grammar and Dictionary of Western Panjabi* (Lahore, 1899); O'Brien, *Glossary of the Multani Language* (ib., 1881); Starkey and Bussawa Sing, *English and Punjabee Dictionary* (Calcutta, 1849); Newton and Janvier, *Dictionary of the Panjabi Language* (Lodiana, 1854).

PANJANDRUM, The Grand. An imaginary person in a jumble of nonsense made up by Samuel Foote to test the remarkable memory of Macklin, the actor. The title is sometimes applied to a person of leading importance in a community.

PANJIM, pän-zhēn'. The capital of the Portuguese possession of Goa (q.v.) in India.

P'AN-KU, pän'kōō'. A mythical being, invented by the later compilers of Chinese legends, said to have been the first development of conscious being out of chaos. The original historians say nothing about P'an-ku, but the Chinese names given him in popular speech and in the voluminous mediæval literature seem to mean 'Embryo'; Prince of the Three Powers (of Heaven, earth, and man); Son of Heaven, etc. The legends of this reputed first conscious being are greatly embellished, according to the fancy of myth-making writers. After toiling millions of years to bring the earth into shape, he died and his breath became wind and cloud; his voice, thunder; his left eye, the sun; his right eye, the moon; his teeth and bones, metals; his marrow, pearls and precious stones; his sweat, rain; and

the parasites on his body impregnated by the wind, the human species.

PAN MICHAEL. A novel by Henryk Sienkiewicz (1887). With the novels "With Fire and Sword" and "The Deluge," it completes the great trilogy on the Polish wars of the seventeenth century. Michael Volodyovski, the little knight and marvelous swordsman, who appeared in the earlier tales, is the hero in this romance of the Tatar invasions and border warfare. Zagloba, a Polish Falstaff, draws Michael from his retirement in a monastery to the war, to which his wife, Basia, follows him. At the surrender of Kamenyets to the Sultan, Michael and Kelting blow up the castle and perish in the ruin.

PANNA, or **PUNNAH,** pŭn'ä. A native State of the Bundelkhand Agency (q.v.), Central India. Area, 2568 square miles; population, in 1881, 227,306; in 1891, 239,333. Capital, Panna.

PANNO'NIA. A province of the ancient Roman Empire, bounded on the north and east by the Danube, and on the west by the mountains of Noricum, and on the south reaching a little way across the Save, and thus including part of modern Hungary, Slavonia, and parts of Bosnia, Croatia, Carniola, Styria, and Lower Austria. It received its name from the Pannonians, a race of doubtful origin, who at first dwelt in the country between the Dalmatian mountains and the Save, in modern Bosnia, and afterwards more to the southeast in Mœsia. The Roman arms were first turned against them and their neighbors, the Iapydes, by Augustus in B.C. 35, and after the conquest of Segestica or Siscia (Sziszek) he subdued them. An insurrection took place in B.C. 12, which Tiberius crushed after a long struggle, and a more formidable one of the Dalmatians and Pannonians together in A.D. 6, which was suppressed by Tiberius and Germanicus, but not without a two years' struggle. Fifteen legions had to be assembled against the Pannonians, who mustered 200,000 warriors. Hereupon the Pannonians settled in the more northern districts, which received their name, and of which the former inhabitants, the Celtic Boii, had been in great part destroyed in Cæsar's time. The country was now formed into a Roman province, which was secured against the inroads of the Marcomanni and Quadi by the Danube, and on its other frontiers had a line of fortresses. Military roads were constructed by the conquerors, who also planted in the country many colonies and municipia, and thus gave it a rough coating of civilization. The country was divided by Trajan, during the Dacian wars, into Upper (or western) and Lower (or eastern) Pannonia, and under Galerius and Constantine it underwent other changes. Upper Pannonia was the scene of the Marcomannic war in the second century. In the fifth century Pannonia was transferred from the Western to the Eastern Empire, and afterwards given up to the Huns. After Attila's death, in 453, the Ostrogoths obtained possession of it. The Longobards under Alboin made themselves masters of it in 527, and relinquished it to the Avari upon commencing their expedition to Italy. Slavic tribes also settled in the south. Charlemagne brought it under his sceptre. In the reigns of his successors the Slavs spread northward, and the country became a part of the great Moravian kingdom, till the Magyars or Hungarians took it in the end of the ninth century. In the time of the Romans the chief towns of Upper Pannonia were Carnuntum (Petronell), Petovio (Pettau), Siscia (Szisszek), Emona (Laibach), Savaria (Stein and Anger), and Vindobona (Vienna); of Lower Pannonia, Aquincum (Alt-Ofen, or Old Buda) and Sirmium (Mitrovic).

PANNUS. See CONJUNCTIVITIS.

PANO, pä'nō. A tribe of the Huallaga and Ucayali rivers, Northeastern Peru, the nucleus of those constituting the Panoan stock (q.v.). According to their traditions they have emigrated from a northern region. In 1670 the missionary Lucero collected a part of them into a settlement at the mouth of the Huallaga. In 1830 they removed to the mission of Sarayacu on the Ucayali, where they still reside. They are expert boatmen, building canoes of 40 feet in length, and they have a frank, easy, and courteous bearing, but are much given to drunkenness. It is said that they formerly preserved pictograph records painted on paper manufactured from the fibre of banana leaves. They number less than 2000.

PANOAN STOCK. An important South American linguistic stock, comprising some 20 tribes occupying the immense forest region on the upper portions of the Madeira, Beni, Parus, Javary, Ucayali, and Huallaga, east of the Andes and south of the Amazon, in Peru, Bolivia, and Western Brazil. Although apparently of more than average native intelligence, they are almost all in their original savage condition, some of them being even accused of cannibalism. Several of their tribes are light in color. Like most of the peoples of the Amazon region, they are steadily decreasing in number. Among the most important tribes of the stock are the Cashibo, Conibo, Mayoruna, Pano, Remo, Senci, Setebo, and Shipibo.

PANÓFKA, pä-nôf'kä, THEODOR (1801-58). A German archæologist, born and educated in Breslau. He began the important excavations at Nola, Italy, and at the establishment of the Archæological Institute at Rome became its secretary. In 1844 he was named professor of archæology at Berlin. His works, which are still valuable for the material collected and for the illustrations, include: *Neapels Antiken* (1828); *Musée Blacas* (1830-33); and *Bilder antiken Lebens* (1843).

PANORAMA (Neo-Lat., from Gk. *πᾶς, pas,* all + *ὅραμα, horama,* view, from *ὁρᾶν, horan,* to see). A pictorial representation of the whole surrounding landscape as seen from one point. It differs from a painting in that the latter only gives part of the landscape, and aims at artistic effect, whereas the chief aim of the panorama is optical illusion. The first step in the construction of a panorama is to obtain sketches of the entire region to be represented; each sketch is a representation of a portion of the landscape in the form of a sector of a circle, with the sketcher's position as a centre, and the horizon for circumference. The canvas to which the sketches are to be transferred is hung round the sides of a circular room, and forms the surface of a cylinder, on the inside of which the panorama is painted. The stage from which the picture is viewed is placed in the centre of the room, about

30 feet on every side from the picture: the picture itself is fastened above to a strong circular hoop, and, hanging down, has its lower edge fastened to a similar hoop, which is heavily weighted to keep the picture steady. The light is admitted by an aperture in the roof, which is concealed by an awning from the spectators on the stage.

The idea of a panorama was first conceived by the architectural painter Breisig, of Danzig, but the first to put it in execution was Robert Barker, a painter, of Edinburgh, to whom the idea occurred while taking a sketch of the city from the top of Arthur Seat. After surmounting numerous difficulties—one of which was the invention of a new kind of perspective for the horizontal lines—he succeeded in producing an effective panoramic view of Edinburgh, which was exhibited in that city in 1788, and in London in the following year. The next panorama executed by Barker was a view of London from the top of the Albion mills, which was followed by scenes from the Napoleonic wars. In 1799 the panorama was taken up in Paris, where it was much improved, and whence it was introduced into other European cities. Its use has greatly increased since the Franco-Prussian war of 1870-71. By the employment of plastic objects, in addition to painting, the painter Philippoteaux greatly increased the optical illusion, as was seen in his admirable panorama, "The Siege of Paris," exhibited in 1875. He was also employed in the United States on a panorama of the "Battle of Gettysburg," which was exhibited in New York, 1888-91, and afterwards in other American cities. In recent years many artists of ability have painted panoramas, which are now to be found in most of the chief cities of Europe and the United States. Consult Bapst, *Essai sur l'histoire des dioramas* (Paris, 1891).

PANORMITA, pä'nôr-mē'tä, Antonio Beccadelli (1394-1471). An Italian humanist, born at Palermo, whence the name Panormita by which he is commonly known. He was educated at Siena and taught classics at Pavia, Bologna, and Padua. His most notorious work was the collection of obscene elegies entitled *Hermaphroditus*, which, though attacked by some of the lesser clergy, and condemned by the Pope, won praise from the scholars of the time for its elegant Latinity. In 1435 Alfonso of Naples pensioned him and made him historiographer.

PANOR'MUS. The ancient name of Palermo (q.v.).

PANPSYCHISM, pān-sī'kĭz'm (from Gk. *πᾶς, pas,* all + *ψυχή, psychē,* soul). A term of somewhat rare occurrence which designates the metaphysical theory that the whole of nature, inanimate and animate alike, is endowed with mind, or has a mental side or aspect; so that the atom of the physicist, no less than man himself, though of course in immeasurably less degree, is ensouled, and the movements of the atom, no less than the voluntary movements of man, are accompanied by mental process. The name may be applied, in ancient philosophy, to the Stoic doctrine of Allbeseelung, as opposed to the earlier hylozoism; and, in modern times, to such philosophical beliefs as were held by Thomas Carlyle, still more to such a philosophical system as that of Fechner. Every pantheistic system (see Pantheism) is also, in a sense, panpsychistic. In particular, certain of the Arabian philosophers, notably Averroës (q.v.), have been termed panpsychists by the historians of philosophy.

PANSA, House of. The name given to the ruins of a large dwelling in Pompeii, from an election notice painted on its front wall. The house is interesting chiefly on account of the regularity of its plan. Although extensive, it contained few large apartments, but was cut up into small rooms and contained a number of shops, including a bakery. None of the wall decorations are preserved.

PANSLAVISM, pān-slāv'iz'm (from Gk. *πᾶς, pas,* all + Ger. *Slave,* Slav, from OChurch Slav. *Slovĭninu,* Russ. *Slavyanin* Slav). The term applied to a movement in which Russia as the great Slavic nation has assumed the leadership, for the political and cultural union of all races of Slavic descent. It had its origin about 1830 and was fostered by the general awakening of the national spirit which characterized the Europe of that time. The movement throughout Central Europe was paralleled by the Slavophile movement in Russia which had for its object the regeneration of the country through a return to the old ideas of Russian civilization as they had stood before the Western innovations of Peter the Great. Russia, owing to its predominant position in European affairs under Nicholas I., came to be regarded as the protector of the scattered Slavic peoples living under Austrian, Prussian, or Turkish rule. In 1848 the leading promoters of Panslavism summoned a congress at Prague, which was attended by Slavs from Bohemia, Moravia, Silesia, Servia, Croatia, Dalmatia, and Poland. Since 1860 Panslavism has exerted direct influence on Austro-Hungarian politics, both northern and southern Slavs tending toward united action in opposition to the Germans and Magyars. In 1867 a great Slavic congress was held at Moscow, but with little material result. It was largely as the natural champion of the oppressed Slavs of the Balkan peninsula that Russia declared war on Turkey in 1877, and the politics of the peninsula since then have been influenced to a considerable degree by the ambitions of the Panslavists. Up to the present time, however, the Panslavic spirit has asserted itself most effectually in the field of literature and more especially in philology, where the researches of many scholars have resulted in laying down the principles for a comparative science of Slavic languages.

PANSY. See Violet.

PANTÆ'NUS (Lat., from Gk. *Πανταινός, Pantainos*). Teacher of the Christian catechetical school in Alexandria about 180-195. Little is known about him, but he was probably a native of Sicily, trained in the Stoic and Pythagorean philosophy, and converted to Christianity in adult life. His fame rests chiefly upon his work as a teacher, which is described with affectionate admiration by his celebrated pupil Clement. (See Clement of Alexandria.) Tradition relates that he went on a mission to India, which is not improbable. He is said to have written commentaries on the Scriptures, but none have survived. It has been suggested that he may have written the last two chapters of the Epistle to Diognetus. There is no trace of him after the

persecution under Septimius Severus (203). The small fragments ascribed to Pantænus are given in Routh's *Reliquiæ Sacræ* (Oxford, 1846). Consult: Harnack, *Geschichte der altchristlichen Literatur* (Leipzig, 1893); Bigg, *The Christian Platonists of Alexandria* (London, 1886); Cruttwell, *Literary History of Early Christianity* (ib., 1893).

PANTAGRUEL, *Fr. pron.* pän'tà'grụ'ĕl'. The son of the giant Gargantua and the chief character in Rabelais's romance, *Gargantua et Pantagruel*. In the fifteenth century mysteries the name is given to a demon who throws salt into the mouths of sleeping persons, and Rabelais made the character King of the Dipsodes (thirsty). Like his father, Pantagruel is the hero of various burlesque adventures imitating the exploits of chivalry.

PANTALEON (?-A.D. 305). A Roman saint, physician, and martyr, born, it is supposed, at Nicomedia in Bithynia. He studied medicine and became special physician to the Emperor Galerius. He was a Christian and was martyred as such. He is the patron saint of physicians, and his feast is kept on July 27.

PANTALEON. A large dulcimer, named by Louis XIV. in honor of its inventor, Pantaleon Hebenstreit. It was four times the size of the dulcimer, and had two soundboards, on one side strung with strings of wire and brass, and on the other side with gut strings. It was played with small wooden mallets, with which the strings were struck. The pantaleon was the direct precursor of the pianoforte (q.v.).

PANTELLARIA, pän'tĕl-là-rē'à, or **PANTELLERIA.** A small island in the Mediterranean Sea between Sicily and Africa, and belonging to Italy. It is of volcanic origin, and has an extinct crater 2743 feet high, and several hot springs. The soil is fertile, producing grapes, cotton, and olives, and the harbor on the northwest coast has considerable shipping. Population, in 1901, 8619.

PANTENIUS, pän-tā'nē-ụs, THEODOR HERMANN (1843—). A German novelist. He was born at Mitau, Courland, studied theology in Berlin and Erlangen, and for six years taught at Riga, where he edited the *Baltische Monatsschrift* (1870-76). He lived at Leipzig, was editor of the weekly *Daheim* (1876, sqq.) and the *Monatshefte* (1886 sqq.); and in 1891 followed his papers to Berlin. Pantenius wrote, under the pseudonym of Theodor Hermann, some excellent sketches and novels, portraying life in Lithuania and Courland; such as *Wilhelm Wolfschild* (2d ed., 1873), *Allein und frei* (1875), *Das rote Gold* (1881), and *Kurländische Geschichten* (1892). A complete edition of his works appeared in nine volumes (1899).

PANTHEISM (from Gk. πᾶς, *pas*, all + θεός, *theos*, god). The name given usually by its opponents, and with a touch of *odium theologicum*, to any system of speculation which identifies the universe with God (*acosmism*) or God with the universe. The latter kind of pantheism is further subjected to the accusation of atheism (q.v.); the former has often been the expression of an intense religious consciousness (as in Spinoza). The term pantheism was apparently coined by John Toland in the eighteenth century, but the antiquity of the view it designates is undoubtedly great, for it is prevalent in one of the oldest known civilizations in the world—the Hindu. Yet it is a later development of thought than polytheism (q.v.). Hindu pantheism, as acosmism, is taught especially by the Upanishads (q.v.) and by the Vedanta (q.v.). The Hindu thinker regards man as born into a world of illusions and entanglements, from which his great aim should be to deliver himself. Neither sense nor reason, however, is capable of helping him; only through long-continued, rigorous, and holy contemplation of the supreme unity (Brahma) can he become emancipated from the deceptive influence of phenomena and fit to apprehend that he and they are alike but evanescent modes of existence assumed by that infinite, eternal, and unchangeable being who is all in all.

Greek pantheism finds a somewhat inarticulate expression in Xenophanes (q.v.), but comes to full utterance in the writings of the Stoics (q.v.). To the views of Neo-Platonists (see NEO-PLATONISM) a pantheistic tendency is often attributed, but it is doubtful whether emanationism does not logically escape pantheism.

During the Middle Ages Johannes Scotus Erigena (see ERIGENA) was one of the few Christian pantheists. Among the Arabian philosophers pantheism was more current.

Modern pantheism first shows itself in Giordano Bruno (q.v.). Spinoza (q.v.) comes next among modern pantheists in the order of time, and he is perhaps the greatest, certainly the most rigorous and precise, of the whole class that either the ancient or the modern world has seen. See Plumtre, *General Sketch of the History of Pantheism* (London, 1881).

PAN'THEON (Lat., from Gk. Πάνθειον, *pantheion*, temple to all the gods, neu. sg. of πάνθειος, *pantheios*, relating to all the gods, from πᾶς, *pas*, all + θεῖος, *theios*, divine, from θεός, *theos*, god). A temple to all the gods; hence in particular, the greatest of such temples at Rome. The first Pantheon, erected in B.C. 27 by Valerius of Ostia for M. V. Agrippa, was a rectangular edifice behind the Baths of Agrippa. Injured or destroyed by lightning under Trajan, it was replaced in A.D. 123 by the existing circular edifice erected by Hadrian, as is proved by the discoveries of Chidânne in 1892. The porch of sixteen superb colossal monolithic Corinthian columns appears to have been built with materials from Agrippa's porch and to have been altered from a decastyle to an octastyle porch, perhaps by Septimius Severus, A.D. 202. The Pantheon was further remodeled by Caracalla; it is possible that the interior paneling of the dome, which offers many puzzling problems, dates from this time and was hewn in the originally smooth vault. The Pantheon is the most perfectly preserved and the noblest work of Roman architecture. It consists of a circular hall, 142½ feet in internal diameter, supporting a dome rising to a height of 142 feet, and pierced at the summit by an oculus or opening 27 feet in diameter—the only window in the edifice, but wonderfully effective in its effect of interior lighting. Seven niches for statues adorn the interior, which, however, has lost much of its original aspect since the 'restorations' of 1748-56. The Pantheon, often called in Rome 'La Rotonda,' has been since A.D. 608 a Christian church. In 663 it was despoiled of its statues and bronze adorn-

ments by the Emperor Constans, and in 1632 the superb bronze vault of the portico was removed by Urban VIII., to be used in casting the baldacchino of Saint Peter's Church.

The name Pantheon has been also applied to a number of domical buildings, among which the most important is the Church of Saint Geneviève at Paris, erected 1764-1781 by the architect Soufflet in a somewhat cold but highly elegant and dignified classic style. During the Revolution it was desecrated and dedicated to the great men of France; according to the classic tendencies of the time, it was called 'Le Panthéon,' and has retained this name ever since, although in 1826 it was restored to Catholic worship and reconsecrated. In plan it forms a Greek cross of about 255 feet in width and length, exclusive of the noble portico in front. The dome over the intersection, 70 feet in diameter and rising 268 feet in air, is adorned externally with a superb peristyle of 32 colums.

Bibliography. Hirt, *Osservazione sopra il Panteon* (Rome, 1791); Adler, *Das Pantheon zu Rom* (Berlin, 1872); Piranesi, *Antichità romane* (Rome, 1768); Isabelle, *Edifices circulaires* (Paris, 1843); Lanciani, *Ruins and Excavations of Ancient Rome* (trans., Boston, 1897); Gosset, *Les coupoles d'orient et d'occident* (Paris, 1889).

PANTHER (OF. *pantere, panthere*, Fr. *panthère*, from Lat. *panthera*, panther, from Gk. *πάνθηρ, panthēr*, panther; perhaps connected with Skt. *pundarika*, tiger). (1) The leopard (q.v.). Sportsmen use the term rather loosely, although some attempt to distinguish the large, more uniformly colored specimens by this name. (2) In the United States, the puma. The name was more common in early days than at present, and more often heard in the dialect corruption, 'painter,' than in its true form. See Puma.

PANTHER-CAT. The ocelot (q.v.).

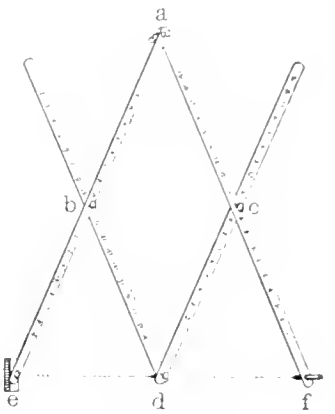
PANTHER-COWRY. An Oriental cowry (*Cypræa pantherina*), red-brown, densely spotted with blackish. See Cowry; and Colored Plate of Gastropods.

PANTHER-TOAD. A large smooth-skinned toad of Northwestern Africa, which has the upper parts adorned with a pattern of dark-edged, reddish-brown patches upon a yellowish ground, and the under parts white. This beautiful species is noted for the ease with which it may be tamed. A very similar species is to be found all over Central and Southern Africa. The former is *Bufo panthorina*, and the latter *Bufo regularis*.

PAN'TICAPÆ'UM. The ancient name of Kertch (q.v.).

PANTIN, päN'tăN'. A town of France in the Department of Seine, situated northeast of Paris just outside the fortifications. It has sugar refineries and manufactures glass and oilcloth. Population, in 1901, 29,716.

PANTOGRAPH (from Gk. *πᾶς, pas*, all + *γράφειν, graphein*, to write). An instrument used to make an outline copy of a map, design, drawing, or other picture either at the same scale or larger or smaller. It consists of four rods so joined as to form a parallelogram. One of the rods is pivoted about a fixed axis, while the apparatus is supplied with a tracer or point which is moved over the original drawing and a pencil which makes the line of the copy. A form of the pantograph which is extensively used is shown in the illustration. The rods are jointed at *a, b, c*, and *d*, so that *ab* is equal to *cd* and *ac* to *bd*, thus making the figure *abdc* a parallelogram. At *d* and *f* are the tracing point and pencil respectively, while at *e* the rod is pivoted so as to move freely. The points *e, d*, and *f* are in a straight line which is maintained no matter how the framework is moved about *e*. The triangles *bcd* and *acf* are similar and the distance traversed by the point *f* with respect to that traversed by *d* will depend on the ratio of *ae* to *af*. It is of course



SIMPLE PANTOGRAPH.

possible to interchange *f* and *d*, and in that case there will be a reduced drawing made. By means of screws or pins at *b* and *e* the ratio of the sides of the parallelogram and the scale of reduction may be altered to suit the artist, the appropriate scale being marked on the arms. There are several forms of pantographs and instruments in which numerous refinements in the way of rollers, pivots, suspenders, etc., are introduced, but all operate on the principle just described. The invention of the pantograph is ascribed to Christopher Scheiner, a Jesuit priest, in 1603, and a description of the instrument was published at Rome in 1631.

PANTOJA DE LA CRUZ, pän-tō'hä dä lä krōōth, Juan (1551-c.1609). A Spanish painter, born in Madrid. He was a pupil of Coello, whom he succeeded as Court painter to Philip II. He continued in that position under Philip III., and repeatedly painted the portraits of both these monarchs, besides those of many other members of the royal family. Although he executed several fine altarpieces and excelled also in painting animals, he is chiefly famous as one of the great portrait painters of Spain. His style resembles that of his master, but is more remarkable for care and finish than for vigor and freedom. In the Madrid Museum may be seen a "Birth of the Virgin," a "Nativity," besides portraits of Charles V. (2), Philip II., Queen Isabel de Valois (2), and others; in the Pinakothek at Munich the portraits of Archduke Albrecht (1600) and his consort Isabella (1599), and in the Vienna Museum two portraits of a child (one dated 1604).

PANTOMIME (Lat. *pantomimus*, from Gk. *παντομιμος*, one who acts by dancing and dumb show, all-imitating, from *πᾶς, pas*, all + *μῖμος*,

mimus imitator, from μιμεῖσθαι, *mimeisthai*, to imitate). The art of dramatic representation without words, through expression by attitudes and gestures. Among the Romans the term *pantomimus* was applied to the actor himself. Whether pantomimic performances had a distinct existence under the Republic it is hard to say, but Augustus showed great favor to this kind of entertainment, which seems to have arisen from the older custom of separating the actor and the reciter of dramatic dialogue; the fact also that in the great open theatres the Roman public could see much more easily than it could hear, probably contributed to the popularity of mute acting. As the *pantomimi* wore masks, no facial mimicry was possible; everything depended on the movements of the body. There was, however, commonly at the rear of the theatre, a choir, which sang the story by way of interlude or accompaniment; and as the subjects presented in dumb show were chiefly mythological love stories, they were consequently well known to the spectators. The earlier *pantomimi* came singly upon the stage, acting successively all the characters involved in the story; later several appeared together. The most celebrated *pantomimi* of the Augustan Age were Bathyllus (a freedman of Mæcenas) in comedy, and Pylades and Hylas in tragedy. The class soon spread over Italy and the provinces, and became so popular with the Roman aristocracy, who used to invite male and female performers to their houses to entertain their guests, that Tiberius thought it necessary to check the vanity of the *pantomimi* by issuing a decree forbidding the senators to go to their houses and knights to be seen walking with them on the streets. Under Caligula they were again in favor, and Nero even went the length of acting in a pantomime. From this period the *pantomimi* enjoyed unbroken popularity so long as paganism held sway in the Empire.

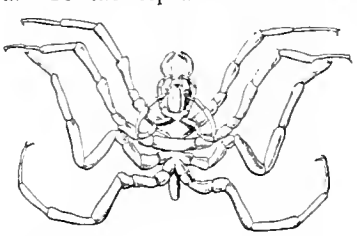
Pantomimic elements have always been found in the popular theatres, notably in the early Italian *commedia dell' arte*, in which were developed the characters of Harlequin, Pantaloon, Columbine, and the rest of their familiar troupe. In France in the seventeenth and eighteenth centuries the word pantomime was applied to a kind of mythological spectacle at the Opéra, in which allegorical characters appeared in appropriate costumes. The great *ballets d'action* of Noverre were really pantomimic in character. In the first half of the nineteenth century, at the famous little Théâtre des Funambules in Paris, pantomime enjoyed for some years a remarkable revival under the genius of Deburau and his associates.

In England the first pantomime is said to have been produced at Drury Lane in 1702. It was *The Tavern Bilkers*, by a dancing-master named John Weaver, another of whose pantomimes, *The Loves of Mars and Venus*, had a remarkable success. But it is to the noted harlequin John Rich that the establishment of the familiar Christmas pantomime is generally credited. In December, 1723, he brought out at Lincoln's Inn Fields *The Necromancer, or the History of Dr. Faustus*, by way of rivalry to *Harlequin Dr. Faustus*, which had been produced at Drury Lane not long before. Pantomimes were not then, however, limited to the Christmas season, but were regarded, as they have sometimes been since then, as a means for filling the theatre's treasury and supplementing the attractions of the legitimate drama. English pantomime was further developed by the coming in 1758 of the Grimaldi family. Joseph Grimaldi (q.v.), who was born in 1779, was especially clever at inventing tricks and devising machinery. *Mother Goose* and others of his harlequinades were long popular. A special feature in the early part of the last century was the 'transformation scene,' in which was made the change of characters to the harlequinade proper, or latter part of the programme. The subjects of these pantomimes have been generally found in popular tales like those of Aladdin, Blue Beard, Cinderella, or Little Red Riding Hood.

In the United States pantomime has for the most part been little more than an occasional importation, though such a show as *Humpty Dumpty*, with George L. Fox as clown, about 1870, had an enormous and long-continued popularity.

Consult: Broadbent, *A History of Pantomime* (London, 1901); Friedländer, *Sittengeschichte Roms* (Leipzig, 1890); Champfleury, *Souvenirs des Funambules* (Paris, 1859); Disraeli, "The Pantomimical Characters," in *Curiosities of Literature* (12th ed., London, 1841). See BALLET; HARLEQUIN; MIME, etc.

PANTOP'ODA (Neo-Lat. nom. pl., from Gk. πᾶς, *pas*, all + πούς, *pous*, foot). An aberrant group of arthropods, which seem to stand nearer the Arachnida than any other class. They are spider-like in form, with very long slender limbs arising from a remarkably small body, whence they have been called 'no-body crabs.' Each of the four pairs of legs contains a long cæcal prolongation of the stomach. The body consists of a cephalothorax, consisting of an anterior proboscis, succeeded by three segments, and one thoracic segment, behind which are three free thoracic segments and a minute rudimentary abdomen. To the cephalothorax are attached



A TYPICAL PANTOPOD, OR 'NO-BODY CRAB.'

four pairs of appendages, one or both of the first two of which may end in a forceps. These are succeeded in the male alone, by a pair of vigorous legs, and the first pair of thoracic legs, while each of the three free thoracic segments bear a pair of very long legs; there are thus in all seven pairs of appendages. The animal breathes through the walls of the body, and, as in all marine arthropods, there are no urinary tubes. In most of the forms there is a slight metamorphosis, the larva having three pairs of appendages. In one form the larvæ are internal parasites in certain hydroids. These sea-spiders live at various depths from between tide-marks to deep water. The group was formerly named Pycnogonida. By some authors they are sup-

posed to be allied rather to Crustacea than to Arachnida, having one more pair of limbs than any arachnidan.

PÁNUCO, pä'nōō-kō. A river in Mexico, rising by several headstreams on the Mexican Plateau, and flowing northeastward to the Gulf of Mexico, on the boundary between the States of Tamaulipas and Vera Cruz. With the construction of the jetties, the bar at its mouth has been removed, and it is now accessible to steamers of 24 feet draught. Tampico, at its mouth, is now one of the most important ports in Mexico.

PANURGE, pä'nurzh'. An important character in Rabelais's *Gargantua et Pantagruel*. He is discovered by Pantagruel at Paris and becomes his friend. Panurge is given to practical jokes, and is gifted, hand-some, and always without money. His desire for enlightenment on the subject of his marriage leads to the voyage to the oracle of the Dive Bouteille.

PANY'ASIS, or **PANY'ASSIS** (Lat., from Gk. *Πανύασις*) (?-c.454 B.C.). A Greek epic poet of Halicarnassus; a relative, probably an uncle, of Herodotus, the historian. He was put to death by Lygdamis, the tyrant of Halicarnassus, for assisting his native town in a fight for freedom. He was the author of a poem in 14 books and 9000 verses, entitled *Heraclea* (*Exploits of Heracles*), which led the critics of the Alexandrian school to rank him among the five great epic poets. There are extant a few elegantly written fragments on the use and abuse of wine-drinking, which are said to resemble the elegies on the same subject by Xenophanes and Theognis. According to Suidas he was also the author of *Ionica* (*Ἰωνικά*), an elegiac poem of 7000 lines on the history of Neleus, Codrus, and the Ionian colonies. The fragments have been edited by Tzschirner (1842), and by Kinkel in the *Epicorum Græcorum Fragmenta* (1877).

PANZER, pän'tsĕr, Georg Wolfgang (1729-1805). A German bibliographer. He was born at Sulzbach, studied theology at Altdorf, and lived at Etzelwang, a suburb of Nuremberg, and in that city as pastor and author. He was for several years director of the city library, and wrote: *Geschichte der romisch-katholischen deutschen Bibelübersetzung* (1781); *Geschichte der deutschen Bibelübersetzung M. Luthers von 1517-81* (1783); *Annalen der ältern deutschen Litteratur* (1788); *Aelteste Buchdruckergeschichte Nürnbergs* (1789); and *Annales Typographici* (1793-1803), a valuable catalogue of the old prints of all countries, in 11 volumes.

PAOAY, pä'ō-ī'. A town of Northern Luzon, Philippines, in the Province of Ilocos Norte. It lies near the western coast, 11 miles south of Laoag (Map: Philippine Islands, E 1). Population, 11,848.

PAOLA, pā-ō'lá. A city and the county-seat of Miami County, Kan., 43 miles south by west of Kansas City; on the Saint Louis and San Francisco, the Missouri Pacific, and the Missouri, Kansas and Texas railroads (Map: Kansas, H 3). It has a public library with more than 5500 volumes. The city is in a productive farming and stock-raising country, rich also in natural gas and coal. There are grain elevators and wagon shops. Paola was first settled in 1855, and in 1869 was chartered as a city. Population, in 1890, 2943; in 1900, 3144.

PAOLI, pä'ō-lē, Pasquale (1725-1807). A Corsican patriot, born at Morosaglia. His father, having taken a leading part in the insurrection against the Genoese, was obliged to flee to Naples in 1739. There Paoli received an excellent education. In July, 1755, he was summoned to Corsica, and elected Captain-General of the island, and the chief of a democratic government. He energetically and successfully applied himself to the reformation of the barbarous laws and customs of the island, and at the same time to the expulsion of the Genoese, who lost, in a short time, nearly all their strongholds. The fleet of the Genoese was also defeated and they were obliged to seek help from France. Finally, in 1768, Genoa ceded the island to France. Paoli refused all offers of the French Government, and continued to struggle for the independence of his country, but was defeated by the superior force of the Count de Vaux, and the French became masters of the island. After continuing the vain struggle for a year, Paoli was compelled to take refuge on board a British frigate, in which he sailed for England, where he was well received and granted a pension by the King (1769). Twenty years afterwards the French Revolution of 1789 recalled him to Corsica as lieutenant-general and military governor. Subsequently, when the island became a department, he was made president of the administration and commander of the National Guard. After the execution of Louis XVI. Paoli's attitude toward the Convention changed. With the active sympathy of England, he organized in 1793 a revolt against the Convention. He was proscribed by that body and made general-in-chief and president of the Council by a *Consulta* which assembled at Corte. He now openly allied himself with Great Britain, and favored the landing of 2000 British troops on the island in 1794, with whose aid he drove out the French. He was forced, however, to surrender the island to the English. Disappointed in his hope of being made Viceroy, and finding his influence over the Corsicans gone, he retired from the island in 1796, and spent the remainder of his life in England, where he died near London, February 5, 1807. In 1889 his body was removed to Corsica and there buried with great honor and solemnity. The earliest account of Paoli is found in Boswell's *Account of Corsica* (Glasgow, 1768). Consult also: Arrighi, *Histoire de Pascal Paoli* (Paris, 1843); Bartoli, *Histoire de Pascal Paoli* (new ed., Bastia, 1891).

PAOLO VERONESE, pä'ō-lō vā'rō-nā'zā. See Veronese, Paul.

PAOMBONG, pä'ōm-bŏng'. A town of Luzon, Philippines, in the Province of Bulacán (Map: Luzon, E 7). It is situated on the Pampanga River two miles west of Malolos, and has a population of 10,297.

PAO-TING FU, pä'ō-ting' fōō' (locally abbreviated into *Pao-fu*). A walled departmental city of China, capital of the Province of Chi li. It lies about 80 miles southwest of Peking and 76 to the west of Tien tsin; it is connected by rail with Peking, being an important station on the uncompleted Lu-Han Railway from Peking to Han kow (Map: China, E 4). The city contains several old temples, a Mohammedan mosque, several very good streets with well-filled shops, including a

very large number of curio and book shops. The city was occupied by the allied troops during the Boxer rebellion on October 19, 1900.

PÁPA, pä'pō. A town in the County of Veszprém, Hungary, situated on the Tapolcza, about 60 miles south-southeast of Pressburg (Map: Hungary, E 3). It has an extensive palace of the Counts of Eszterházy, a house in which Matthias Corvinus lived, three monasteries, and a Protestant gymnasium. The manufactures include pottery, tobacco, and textiles. Population, in 1890, 14,417; in 1900, 17,426, chiefly Roman Catholic Magyars.

PAPACY (OF. *papacie*, from ML. *papatia*, Papal office, from Lat. *papa*, pope, bishop, father; reduplication of *pa*, an early infantile utterance, supposed to apply to the child's father). The See of Rome considered as an historic institution, claiming to be the head of and centre of unity for the whole Christian Church. The origin of the primacy of Rome is, according to the Roman tradition, to be found (1) in the leading part played by the Apostle Peter in the New Testament records, and (2) in the alleged historic fact of a residence of Peter at Rome as head or bishop of the Christian community there. On the first basis is constructed a theory of a divine commission given to Peter by Jesus Christ, in virtue of which Peter was invested with the three attributes of king, priest, and teacher over all the followers of his master. On the second basis the Roman Church has built up its practical earthly structure of influence and power. The identification of the Petrine idea with Rome was needed to localize and make concrete the abstract claims of a divine commission. Whatever powers were conveyed to Peter by Jesus Christ were now held to be continued in full measure to his duly appointed successors in the Roman bishopric. Although a majority of Christians reject both the Roman interpretation of the Petrine commission and the historical proof of a 'bishopric' of Peter in Rome, and still more emphatically deny any connection whatever between these two sets of ideas, the historian finds abundant explanations of the origin and growth of the Roman supremacy without resorting to these sources. Doubtless the tradition of an Apostolic origin was a powerful aid to the bishops of Rome in enforcing their claims to superiority.

The Roman community was certainly one of the earliest Christian foundations. It enjoyed the prestige of the work and of the martyrdom of the great Apostles, Peter and Paul. It was the centre of life of the vast Roman Empire, and the focal point toward which all ideas streamed in and from which they were redistributed in effective form. Rome, however, had never been an important source of ancient culture. Her gifts to the world were law and administration, her culture was always a borrowed one. This same tradition of practical administrative skill was now to be continued by the Church. The authentic records of Roman church life during the first two centuries are few, and many instances of the exercise of Papal power at this time are not to be found.

The evidences of an aggressive, dominating jurisdiction appear very clearly in the administration of Victor I. (?193-203). This active and zealous churchman was bent upon securing uniformity in the outward practices of the Church, and he made the existing variations in the time of celebrating Easter a test question. He demanded of the Eastern churches agreement with the Roman Easter period and threatened them with excommunication if they refused. Excommunication, as the refusal to share Christian fellowship with an offending brother, was the right of every church, but we distinctly see here the Roman practice of treating it as a punishment to be inflicted by a superior upon an inferior. Irenæus, Bishop of Lyons, himself a Syrian, but in agreement with Victor on the Easter question, admitted the *potentior principalitas* of Rome, a phrase naturally quoted by Roman controversialists to support their claims of right. They also cite, as justification of these claims, a letter of Clement I. to the Corinthians (A.D. 95 or 96), the epistles of Saint Ignatius, and passages of Tertullian, Origen, and other Christian writers of the second and third centuries. Whatsoever may be the value of these testimonies, as cited to sustain the claims of Papal supremacy in these early ages, the subsequent fact of a Papal domination is outlined distinctly in historical perspective by the end of the fourth century.

The Western world turned as naturally to Rome in religious as in secular matters, partly as the result of the habit of centuries, partly because there was no other resort. Papal Rome met the demand with a steadiness and prudence worthy of the great political tradition to which she was succeeding. In matters both of faith and practice she was always to be found on the side of a stanch but liberal orthodoxy. While Gnostics on the one hand and Montanists on the other were trying to make of the Church a select esoteric community of the specially initiated, Rome steered carefully between the extremes and lent all her weight to the 'Catholic' or inclusive idea of the Church, as the medium of salvation for all men. On the vexed questions of heretical baptism and ordination and the treatment of the 'lapsed' her position was always moderate and liberal. While the theologians of the Eastern world were speculating with philosophical refinements over the great Christian problems, the Roman Church quietly but persistently held fast to the idea of a mystery of redemption not to be solved by any human philosophy, but to be accepted once for all by an act of faith. When, in the storms of the Germanic invasions, the weak and cowardly emperors deserted Rome, the Roman bishops repeatedly stood forward in their place and dealt with the invaders in the name of a power greater than their own.

The earliest point at which we can clearly discern the existence of a well-developed machinery of Papal power is in the administration of Leo I. (440-461). He grasped, as none of his predecessors had done, the vast range of his opportunity. He aimed to establish, both in the East and in the West, a system of Papal vicariates through which the Roman jurisdiction could be enforced and the Roman forms of faith and practice maintained. Eastward from the Adriatic his success was only partial and temporary. The pressure of Greek Christianity backed by the forces of the Greek Empire was too great, and we may from this point practically dismiss the East from our view. At the Coun-

cil of Chalcedon (451), the formula of faith presented by Leo was accepted as a sufficient statement of the Christological problem. In Gaul the rising metropolitan power received a serious check in Leo's severe treatment of Hilary of Arles, who had on insufficient evidence deposed Chelidonius, Bishop of Besançon. In 452 Leo went out, armed with none but spiritual weapons, to meet the terrible Attila, and actually turned him back in the full tide of victory. In 455 he again faced a Vandal invasion from the south and succeeded in gaining at least milder terms for the doomed capital.

Especially clear does this Roman leadership appear in the dealings with those Germanic peoples who for a longer or shorter time occupied the soil of Italy and organized there an actual administration of government. The popes of this period, nominally subject to the emperors at Constantinople, never really questioned the *de facto* sovereignty of the barbarian rulers in Italy. With Odoacer (476-493), and then with Theodoric the Ostrogoth (493-526), we find them in relations of friendly temporal subjection. Many cases of Papal privilege and several disputed elections were referred to these barbarous and heretical chiefs of tribes, and their decisions were accepted. It was the wise policy of Rome, at this early stage, to conform itself to actual conditions and make its profit out of them. This *de facto* allegiance was readily transferred to Constantinople when, after the death of Theodoric, the armies of Justinian under Belisarius and Narses finally drove the Ostrogoths out of Italy (535-53). This revival of Byzantine sovereignty was, however, the most serious disaster that could have happened to the Papal idea. Again and again popes were made to feel the rough hand of the Empire if they ventured to act against its will, even on a matter of doctrine. The prestige of Rome was in danger of disappearing, if she were to become merely one among the numerous patriarchates under the fitful dictation of Constantinople. It was really an advantage when the dreaded Lombards swarmed over into the Po Valley (568) and rapidly drove the Byzantine garrisons from most of the country east of the Apennines. The Lombard terror forms the background of the Papal history for nearly two hundred years, but it was one of the means through which the importance of the Papal institution was recognized and justified.

These were the conditions under which Gregory I., the Great (590-604), came to power. From his correspondence we gain for the first time a clear impression of the economic side of the Papal administration. We find a considerable total of landed properties scattered from Africa, through Sicily and Italy, to Gaul, managed directly by Papal agents and serving as the chief financial basis of the Roman bishopric. Gregory, a prudent manager and astute politician, knew how to keep on good terms with the Empire, and even succeeded in making some impression on the Arian Lombards in the direction of their ultimate conversion to Catholicism. He kept up an active correspondence with the Catholic Merovingian princes of the Franks, and was the originator of the conversion of the heathen Anglo-Saxons to Roman Catholic Christianity. In a spirit of wise charity for all human diversities, Gregory I. laid the foundations for a Papal system which would have made the Roman bishop the guide and harmonizer of Western Christendom. As time went on, the hold of the Eastern Empire upon Italy became weaker and weaker. In vain popes implored emperors for help against the Lombards. The Mohammedan conquest absorbed all the energies of the declining Empire, and Rome must turn elsewhere for the material support it needed. Gregory's relations with the Franks gave the clue for the future. So long as the Merovingian dynasty lasted nothing could be done; but when the new and vigorous House of Pepin began to displace the Merovingian princes, the opportunity came. Papal appeals to Charles Martel (Major Domus, 714-741) were flatly refused, but his son, Pepin, needing a sanction for his usurpation of the kingdom, found it worth while to win this of Rome as the price of deliverance from the Lombard terror. More than this, he guaranteed to the Papacy the temporal sovereignty over an ill-defined stretch of territory including Rome and a considerable surrounding country. See PAPAL STATES for the subsequent history of the temporal sovereignty.

With the coronation of Charles the Great as Roman Emperor by Pope Leo III. (800) a new phase of the Papal power begins. The revival of the Imperial name was doubtless intended to connect the actual domination of the Frankish people with the traditions of the ancient Roman world. It was, however, to be several generations yet before the importance of this new connection was to be evident. No emperor from Charles to Otho the Saxon held a position that could in any sense be called 'Imperial.' Even the title disappeared for more than a generation before Otho. Meanwhile the Papacy kept on quietly developing the constitution under which it was to do its great work. The administration of Nicholas I. (858-867), coincident with the notable rise of intellectual culture in West Francia, serves to indicate this progress. Nicholas I. was keen to seize every occasion to assert Papal right of supreme jurisdiction. (1) As defender of a sound Christian morality he took up eagerly the cause of Theutberga, the rejected wife of King Lothair II. of Lorraine, and carried it against the support of the fighting men and the whole clergy of Lorraine to a complete triumph. (2) He assailed the metropolitan power in the person of the great Archbishop Hincmar, the most important prelate in the North, on the old question of the right of a subordinate clergyman disciplined by his local superior to appeal directly to Rome.

With the tenth century we find the Papacy in a phase which seemed at times to imperil all it had gained. Its three functions—the bishopric of Rome, the government of a Roman State, and the headship of Latin Christianity—were often in hopeless conflict, but never more than now. In the furious strife of local parties in which Rome, like every other Italian city, was involved, the Papacy came to be hardly more than the spoil of party victory. Popes of every variety of incapacity and unsuitableness were set up by rivals in politics, and, even if they succeeded in maintaining their hold upon the bishopric and the Roman territory, there was little question of any influence upon the movement of affairs outside this field. It is the most convincing proof of the need in that age of some such central religious authority in Europe that men con-

tinued to pay deference to an institution so careless of its own credit and its own future.

Two causes were destined to bring the Papacy once again into the great currents of European Christianity. The first of these was the renewal of the Empire on a German basis. The entrance of the Saxon people into the Latin-Christian culture (c.830) resulted in a great strengthening of the purely German as distinguished from the half-Romantic elements of the Western world. In 919 the German kingship passed with Henry I. into Saxon hands. His son Otho I. (937-973) took up the kingdom, no longer as a Saxon thane, but as the born King of all Germans, and after twenty-five years of varying success saw his idea of kingship fairly realized. For nearly forty years the Empire had gone begging for a power strong enough to come and take it. In 961 Otho crossed the Alps as of right, and in 962 was crowned Emperor at Rome by Pope John XII., whom he soon uncanonically deposed on accusations of every possible iniquity. He then caused the 'election' of a capable Roman layman, Leo VIII., and maintained him with his sword. He bound the clergy and nobility of Rome by solemn oaths to elect their popes in future 'canonically' and to seek for such election the approval of the Emperor. Thus it was thought to establish a formal balance of rights between these two branches of the highest earthly power. If the Papal sanction be needed to make the Emperor, no less should Imperial approval be necessary to a valid Papal election. But no sooner was the Imperial camp removed from Rome than all the evils of local factional strife broke out again. To end the perpetual conflict, Otho III. (983-1002), a youth of generous enthusiasms, tried the experiment of a Roman residence in conjunction with a German pope, Gregory V., of his own making. For a moment the problem seemed solved, but a new outbreak of Roman fury drove him from the city to his death.

Meanwhile the Church was developing a new energy through the force of its monastic principle, the second cause alluded to above. The Monastery of Cluny in Burgundy began from its foundation about 910 to exercise an influence upon clerical life quite without precedent. This took the form of a purification of the priestly office by ridding it of the frequent vice of simony and by strictly enforcing the rule of priestly celibacy. The reaction of this movement upon society at large is seen in the efforts to bring about the peace of the land known as the 'Peace of God' and the 'Truce of God.' In all this great activity the Papacy as such took no part, but the time came when these ideas took possession of it and made it do their bidding.

The two processes we have noticed—the rise of the Empire and the purification of the Church—come together in the middle of the eleventh century. Another period of Papal depression had followed the work of the Othos, and once more the Papacy became the prey of contending local factions. The office was tossed about in shameless 'deals' or by open violence. In the year 1046 three persons were claiming the Papal power on different grounds. The scandal was too great, and the 'Romans' appealed to the Emperor Henry III. In the synod of Sutri (1046), held on the borders of the Roman territory, Henry brought about the removal of all three claimants and nominated a worthy German prelate who was accepted by the Romans. Two other Germans, also nominated by the Emperor, followed in rapid succession. The last of these was Bruno, Bishop of Toul in Lorraine, who as Pope Leo IX. (1049-54), and under the guidance of the monk Hildebrand, began the aggressive policy of Church reform through Papal action, which is the most important feature of Papal history for the next century. Though nominated by the Emperor, Leo saw plainly that to succeed he must be free from all outside control and rely upon the old Roman traditions. He began his administration by a journey to France and Germany, where in two synods, at Rheims and at Mainz, he proclaimed the articles of the Cluny programme, especially that against simony, and demanded the allegiance of the northern prelates in his crusade against these evils. The conscience of Europe, roused already by the work of the monastic reformers, responded with satisfactory readiness. At Rome Leo IX. found himself involved in an entirely new political situation. The Norman conquerors of Southern Italy had reached a point in their expansion where it was important for them to have a definite legal status. They threatened to encroach upon the Papal territory and actually routed the Pope's army in the battle of Civitate (1053). But the wisdom of Leo turned this rout into a victory by persuading the Normans to become the vassals of the Holy See on condition that their power, within certain limits, should be recognized as a legitimate sovereignty.

The sense of Papal right as paramount is seen still more plainly in the action of Nicholas II. (1058-61). To check the disorders consequent upon the Papal elections and to establish the electoral process on a firm and permanent basis, he procured the passage at the synod of 1059 of a decree whereby the election of the Pope was henceforth to be in charge of the Roman 'cardinals,' including members from all three clerical orders. The initiative was to lie with these, but they were then to procure the assent of the 'Roman people,' and a certain undefined right of participation was reserved to the Emperor. On these three elements—the Roman cardinals, the Roman people, and the Roman Emperor—rested the Papal constitution for the next two hundred years. The greatest conflicts of this period arose from attempts to define more precisely the limits of each element. On the whole, the cardinalate gained steadily upon the other factors, and succeeded ultimately in winning exclusive control, not, however, without decisive modifications in its own make-up.

The Papacy was now definitely committed to the work of reform. The influence of Hildebrand grows more and more perceptible. Under his far-seeing direction what had been started as a purely moral movement becomes in the clearest sense a political one as well. Adding to the two articles of the Cluny programme a third—the prohibition of lay investiture—he combined all three under the one general demand for the 'freedom of the Church' from all external control. (1) The celibacy of the secular clergy was to be the guarantee that the clergy should be free from all the obligations arising from marriage and the social and economic duties that attend it. (2) The abolition of simony was to make the clergy free from all the complications of worldly

interest that must arise if clerical office were to be bought and sold for any valuable consideration whatever. (3) The prohibition of lay investiture was to free the clergy from any relation toward the State which might interfere with the exclusive control of all clerical interests by the supreme ecclesiastical authority, the Papacy itself. The effect of the first was to separate the priest from the family; of the second, to separate him from the temporal interests of the society about him; of the third, to cut him off from any secular service to the State. It was 'freedom' in the sense of a separation that must tend to place a gulf between the clergy and all purely secular interests. On the other hand, it is doubtful if any other process could have stayed the progress of a fatal secularization of the Church that threatened to absorb it entirely in the life of the society of the full fendal period.

As to the question of simony, all thinking men were agreed that it was an evil. The celibacy of the clergy in the major orders was already well established in the habits of most of the European populations, and the sympathy of the masses was decidedly setting toward its extension to the minor orders as well. It was, therefore, a well-considered policy that led Hildebrand from the moment of his accession as Pope Gregory VII. (1073-85) to throw his whole energy into the fight against the lay investiture.

The moment chosen for the conflict with Germany was most favorable. Henry III., the vigorous champion of Imperial right and duty as the guardian of Papal honor, died in 1056, leaving a son, Henry IV., six years old, who was accepted as King under the regency of his pious mother, Agnes of Poitou. In 1073 this son was a clever, head-strong youth of twenty-three, already at odds with many parts of his kingdom, but prepared to press to the utmost all his royal rights. The first proclamation against lay investiture was in 1075, and, though couched in general terms, was plainly aimed at Germany. To give up the right of investiture would have meant for the German King the loss of the most important means of political control, and Henry threw himself upon the loyalty of his clerical subjects. A German synod at Worms (1076) denounced the Pope in unmeasured terms, and threatened him with deposition. He replied by excommunicating the King, whose political enemies utilized the excommunication as a weapon to keep him in a semi-imprisonment until Gregory could carry out his purpose of settling the whole German question in person at a German assembly. Gregory was on his way to this meeting at Augsburg when Henry IV., leaving Germany, hurried over the Alps, met the Pope in the famous interview at Canossa, and won from him the absolution which reinstated him in the allegiance of his subjects, and thus averted the grave political danger of a settlement of German affairs by a Papal council on German soil. Through the long reign of Henry IV., under Gregory and his successors, the fight went on. The Pope repeatedly excommunicated the King and sanctioned the election of anti-kings. The King replied in virtue of his Imperial rights, actual or to be, by 'deposing' popes and causing the election of a series of anti-popes. The immediate question of the investiture was lost sight of in the larger issue—whether Church or State was to control. Henry V. (1106-25) had joined the Papacy against his father, but was no sooner King himself than he was forced into an opposition as much more dangerous as he was more powerful. In 1111 he was able to force the Papacy into a momentary agreement that the clergy of the Empire should be exempt from the Imperial investiture on condition that they should surrender all their temporal property. This agreement was promptly rejected by those most interested on both sides, and led to the final settlement in the Concordat of Worms (1122), whereby the dual nature of the clerical office as at once temporal and spiritual was recognized. The investiture with the spiritualities (ring and staff) was left to the Papacy, while that with the temporalities (sceptre) was held by the Emperor. Similar but less violent conflicts in France and England led to a similar result.

A new phase of the conflict between Church and State begins with the accession of the emperors of the House of Hohenstaufen. The Hohenstaufen (Ghibelline) policy was to extend the German kingdom, under the disguise of the Empire, over Italy. In this ambition it was checked at every turn by the rising power of the Italian city republics. Frederick Barbarossa (1152-90) sought to incorporate these communities into his administration by placing governors (podestà) over them and utilizing their growing wealth for his larger plans. Led by Milan, the Lombard communes steadily resisted. Milan, destroyed in 1162, was rebuilt by her neighbors, and at the head of the great Lombard League gave the Emperor such a defeat at Legnano (1176) that in the Peace of Constance (1183) he conceded practically all the claims of the cities to independence. Throughout this fight the communes were steadily supported by the Papacy. Their party (the Guelphs) was also the Papal party; and though outside the cities there were many territorial nobles and inside there was always a noble faction that looked toward the Emperor, the great masses of the rising industrial population, organized in their craft and merchant guilds, were sturdily Guelph and in every crisis expected the support of the Pope. Henry VI., son of Frederick I. (1190-97), had elaborate plans for refeudalizing Italy and sinking the communes in greater territorial units. Through his marriage with the heiress of the Norman kingdom in the south and the birth of a son in 1194, he seemed to see the realization of the Hohenstaufen policy. His death, the consequent confusion in Germany, and the accession of the great Pope Innocent III. (1198-1216) saved Italy for the time and gave to the Papal power one of its greatest moments of triumph.

Innocent III. realized more completely than any pope before or after him the Hildebrandine ideal. He was able to bring King John of England to surrender the overlordship of the land to him for his support against his nobles. He compelled Philip Augustus of France to take back his rejected wife. In the struggle for the German crown he championed Otho the Guelph against Philip of Hohenstaufen (1198-1208), but when Otho as King (1208-14) proved that no Emperor could be a Guelph, as no Pope could be a Ghibelline, Innocent turned against him at once. He gave his support to France against Germany and England in the battle of Bouvines (1214). By

which his ward the young King Frederick of Sicily gained the Empire. At a Lateran council in 1215 Innocent displayed as it had never been displayed before the legal system on which the working of the Papal idea depended.

The prestige of the Papacy had been greatly increased by its leadership in the Crusades. The Crusade had been commended by Gregory VII. Events in the East had roused attention to it soon afterwards, and Urban II. (1088-99) had made it the chief object of his administration. Throughout the long and not always creditable history of the Crusades (1096-1270), it was the Papacy that gave to it whatever of unity and dignity it had. From Innocent III. we may begin to note the gradual decline of the mediæval Papacy. It had thriven upon the absence of strong national governments in Europe, and the rapid rise of the new nations closed up one by one the channels through which the Papal power had made itself felt. The reign of Frederick II. (1215-50) is one long conflict between the Imperial and Papal schemes in Italy. On the whole, the Emperor was beaten, but the prestige of the Papacy as a universal power was injured. The attempt of the Hohenstaufen to maintain a government in Italy was frustrated, but the Papacy, by bringing the Angevin rulers from France into the South, sowed the seeds of new disaster. Rudolph of Hapsburg (1273-91) began a new policy for the Empire: to leave Italy out of the question in return for a free hand in Germany; and every deviation from this wise policy by his successors only showed again how completely the mediæval ideals of public life were passing over into those of the modern world. The attempts of Henry VII. (1308-13) and Louis the Bavarian (1314-47) to affect the balance of Italian politics proved utter failures.

On the other hand, the same thing is true of Papal attempts to enforce discipline on the rulers of Europe. Boniface VIII. (1294-1303) came to the Papacy as the leader of the cardinalate in an unprecedented crisis. His predecessor, Celestine V., a pious recluse, had so completely fallen into the hands of the Neapolitan Angevins that he had raised to the cardinalate a number of French and Neapolitan prelates. He had then, largely under pressure from Boniface, resigned the Papacy, and now the cardinals found themselves under the domination of such a will as had not been seen in the Papal office since Innocent III. His violent attempts to break down the faction of the Colonna drove his enemies to the Court of Philip IV. of France, and there they found a fertile soil for their complaints. Philip, a completely modern ruler, needing all the money there was to spare in France, laid a tax upon the clergy. Boniface, in a series of able documents, laid down again the Hildebrandine doctrine of the freedom of the Church. Philip appealed to the national sentiment as expressed for the first time in the States-General and won his fight. Boniface, defeated and abused by the personal enemies he had made, died, the last great exponent of the mediæval Papacy.

The wreck of the mediæval scheme of a Papacy and an Empire working in a harmony that was never attained threw the Papacy upon a new alliance. The influence of France now replaces that of Germany. The result of the second conclave after the death of Boniface was the election of a Frenchman, Clement V. (1305-14). The new Pope was met at Lyons by King Philip in person, and as a result of this interview he never left France. The cardinals summoned across the Alps obeyed, and thus began the French residence of the Papacy, the 'Babylonian Captivity' at Avignon (1309-76). This 'exile' came about naturally through the working of the cardinal system. The French influence had secured certain cardinals from Celestine V.; these decided the choice of Clement, and now he in turn was free to appoint enough more French cardinals to decide the character of the college for a generation to come. The close relation of the Papacy to France withdrew from it the sympathies of the other nations, notably of England. It seemed in danger of losing entirely that Roman character which was its only source of authority. Pressure was continually brought to induce the popes to return to Rome; several attempts to do so were made, but were hindered by the French interests of the cardinals. Finally, Pope Gregory XI. did return and died at Rome (1378). The new election, held under fear of violence from the 'Roman people,' resulted in the choice of an Italian, Urban VI., but within a few months the French influence succeeded in raising sufficient doubts as to the validity of this election to justify the cardinals in choosing another Pope, Clement VII. Thus, still by the regular working of the Papal machinery, the Church found itself, for the first time in its history, involved in a schism in which both claimants rested upon the same basis, a lawful election by cardinals.

Both parties appealed to the nations for support. In general, the northern peoples sympathized with the Roman Pope, France and Spain with the French one; but the really important result of the Great Schism (1378-1418) was the discussion it aroused as to the nature of the Papacy and its relations to the Church at large. The feeling was constantly gaining force that the Church as a whole was misrepresented by a system which threw all the weight of the Papal authority into the hands of a small body of persons at Rome. To change these persons to Frenchmen was no relief. What was demanded was a larger share to the nations in the Church constitution. These opinions gained in clearness as the difficulty of breaking the schism through the action of the cardinals became more apparent. The remedy was that most feared by the curial party at all times, a general council, but years passed before a way could be found for calling a council that would be respected. Finally, in 1409, the 'union cardinals' on both sides united in this work, and the Council of Pisa supported them in making a new election. The Pope chosen, Alexander V., lived but a few months, and the same interests succeeded in putting forward John XXIII., who failed utterly to maintain the respect of the Church as against the two claimants set aside at Pisa, who now renewed their claims.

The Church thus found itself in a triple schism, honeycombed with the heresy of Wiclif and Huss and burdened with ecclesiastical abuses which every one saw, but which no one knew how to remedy without danger to the system itself. The Council of Constance (1414-18) met under these conditions. It first attacked heresy by examining and burning John Huss, who, relying upon the safe conduct of the Emperor Sigismund, had voluntarily put himself into its power. It

then proceeded to endless discussions of abuses and the means of relief, only at last to express a series of pious wishes and leave their execution to the Pope, whose election was accomplished by a joint commission of the cardinals and the Council. Naturally, the new Pope, Martin V., of the Roman family of the Colonna, failed to consider himself bound by the action of a council that could not agree within itself upon vital questions, and his 'reforms' were of the most superficial kind. The Papacy had come out of the trial of schism and opposition unchanged in its quality. It could not avert the assembling of the Council of Basel (1431-48), but it steadily opposed it. So long as the Council could keep the respect of Europe it could maintain its existence, and at least succeeded in demonstrating its capacity to do things that the Papal administration had failed to accomplish; but the longer it lasted the more apparent it became that Europe was not ready to exchange the traditional authority of Rome for the novel tyranny of an irresponsible council. Especially when the Council proceeded of its own right to choose a pope, without reference to the Roman tradition, it became clear that such a pope could not be supported. What the Council of Basel really accomplished was to furnish to the nations a pretext for asserting their rights over their own local churches more firmly than ever, as, for example, in the case of France, through the Pragmatic Sanction of Bourges (1438). When this was done the governments were comparatively indifferent to the general question of the Papal constitution itself, and Nicholas V. (1447-55) stands at the beginning of a period more splendid than any other in the Papal annals. The Papacy now entered into the politics of Europe as one among the temporal powers (see PAPAL STATES), fell in with the prevailing enthusiasm for art and letters, and sought to direct the course of the Renaissance movement. In the meantime opposition was slowly and silently gathering in the North, which culminated in the Reformation movement, and directly challenged the traditional supremacy of the Papacy. The Protestant Reformation affirmed as the ground of its justification the financial tyranny, the spiritual indifference, and the anti-national propaganda of the Papacy. It formulated as its programme a return to what it claimed to be the early principles of a private interpretation of Scripture and a personal approach of every Christian man to his God without other mediation than that of his personal faith. Against this demand the Papacy set itself with all the resources of its past. Between the two ideas there was no compromise, and the result was secession. As late as 1541 it was hoped by many sanguine persons on both sides that some common ground might be discovered, but the Council of Trent (1545-63) reaffirmed in unmistakable terms the existing principles of the Papacy as it had come to be. Recognizing the need of 'reform' in many details, the Council carefully avoided any action that might seem like compromise with rebellion. While not admitting in theory the fact of schism, the Papacy henceforth was obliged to recognize it in practice and to devote all its energy to maintaining its hold upon what it had left and extending its sway over new lands. For later history, see ROMAN CATHOLIC CHURCH; PAPAL STATES.

BIBLIOGRAPHY. Mirbt, *Quellen zur Geschichte des Papstthums* (2d ed., Tübingen, 1901); *Bullarium Romanum* (19 vols., Rome, 1655-1857); Jaffé, *Regesta Pontificum Romanorum*, to 1198 (2d ed., Leipzig, 1885-88); Potthast, *Regesta Pontificum Romanorum, 1198-1304* (Berlin, 1874-75); Pflugk-Hartung, *Acta Pontificum Romanorum Inedita* (3 vols., ib., 1881-88); Langen, *Geschichte der romischen Kirche, quellenmassig dargestellt* (Bonn, 1881-93); Gregorovius, *History of the City of Rome in the Middle Ages* (Eng. trans., London, 1894-1902); Reumont, *Geschichte der Stadt Rom* (Berlin, 1867-70); Greenwood, *Cathedra Petri* (London, 1856-72); Mann, *Lives of the Popes in the Early Middle Ages*, vol. i. (Saint Louis, 1902); Barry, *The Papal Monarchy, 600-1300* (New York, 1902); Milman, *History of Latin Christianity*, to 1448, new ed. (London, 1883); Miller, *Mediæval Rome* (New York, 1902); Tout, *The Empire and the Papacy, 918-1273* (London, 1898); Lorenz, *Papstwahl und Kaiserthum* (Berlin, 1874); Emerton, *Mediæval Europe* (Boston, 1896); Bryce, *The Holy Roman Empire* (London, 1889); Pastor, *History of the Popes from the Close of the Middle Ages* (Eng. trans., London, 1891-98); Vidois, *La France et le grand schisme d'occident* (Paris, 1896-1902); Salembier, *Le grand schisme d'occident* (Madrid, 1901); Creighton, *History of the Papacy from the Great Schism to the Sack of Rome* (London, 1897-99); Janssen, *History of the German People from the Close of the Middle Ages* (Eng. trans., London, 1896-1903); Ranke, *History of the Popes in the Sixteenth and Seventeenth Centuries* (Eng. trans., London, 1853-56); Rocquain, *La cour de Rome et l'esprit de réforme avant Luther* (Paris, 1893-97); Puller, *The Primitive Saints and the See of Rome* (3d ed., London, 1900); Rivington, *The Primitive Church and the See of Peter* (ib., 1894); Allies, *The Throne of the Fisherman* (ib., 1887).

The following list is taken from Wetzer and Welte's *Kirchenlexikon*, and may be assumed to represent the conclusions of the best modern Roman Catholic scholarship. Down to Pius II. it follows in general the results reached in Duchesne's learned edition of the *Liber Pontificalis* (Paris, 1886); for the later dates, use has been made of Gams, *Series Episcoporum*, and of Reumont, *Geschichte der Stadt Rom* (Berlin, 1870).

Peter	d. 67 ?	Caius	283-296
Linus	67-79 ?	Marcellinus	296-304
Anacletus	79-90 ?	Marcellus	308-309
Clement I.	90-99 ?	Eusebius	309 (310)
Evaristus	99-107 ?	Miltiades	311-314
Alexander	107-116 ?	Sylvester I.	314-335
Xystus (Sixtus)	116-125 ?	Marcus	336
Telesphorus	125-136 ?	Julius I.	337-352
Hyginus	136-140 ?	Liberius	352-366
Pius I.	140-154 ?	Damasus I.	366-384
Anicetus	154-165	Siricius	384-399
Soter	165-174	Anastasius I.	399-401
Eleutherus	174-189	Innocent I.	401-417
Victor	189-198	Zosimus	417-418
Zephyrinus	198-217	Boniface I.	418-422
Callistus	217-222	Celestine I.	422-432
Urbanus	222-230	Xystus III.	432-440
Pontianus	230-235	Leo I.	440-461
Antherus	235-236	Hilarus	461-468
Fabianus	236-250	Simplicius	468-483
Cornelius	251-253	Felix II.	483-492
Lucius I.	253-254	Gelasius I.	492-496
Stephen I.	254-257	Anastasius II.	496-498
Xystus II.	257-258	Symmachus	498-514
Dionysius	259-268	Hormisdas	514-523
Felix I.	269-274	John I.	523-526
Eutychianus	275-283	Felix III.	526-530

Bonface II.....530-532
John II.....533-535
Agapetus I.....535-536
Silverius 536-537
Vigilius 537-555
Pelagius I 556-561
John III.....561-574
Benedict I.....575-579
Pelagius II.....579-590
Gregory I.....590-604
Sabinianus 604-606
Boniface III.....607
Boniface IV.....608-615
Deusdedit 615-618
Boniface V.....619-625
Honorius I.....625-638
Severinus 640
John IV.....640-642
Theodore I.....642-649
Martin I.....649-653
Eugenius I.....654-657
Vitalian 657-672
Adeodatus 672-676
Donus 676-678
Agatho 678-681
Leo II.....682-683
Benedict II.....684-685
John V.....685-686
Conon 686-687
Sergius 687-701
John VI.....701-705
John VII.....705-707
Sisinnius 708
Constantine 708-715
Gregory II.....715-731
Gregory III.....731-741
Zacharias 741-752
Stephen II.....752-757
Paul I.....757-767
Stephen III.....768-772
Adrian I.....772-795
Leo III.....795-816
Stephen IV.....816-817
Paschal I.....817-824
Eugenius II.....824-827
Valentine 827
Gregory IV.....827-844
Sergius II.....844-847
Leo IV.....847-855
Benedict III.....855-858
Nicholas I.....858-867
Adrian II.....867-872
John VIII 872-882
Marinus I.....882-884
Adrian III.....884-885
Stephen V.....885-891
Formosus 891-896
Boniface VI.....896
Stephen VI.....896-897
Romanus 897
Theodore II.....897
John IX.....898-900
Benedict IV.....900-903
Leo V.....903
Christopher 903-904
Sergius III.....904-911
Anastasius III...911-913
Lando 913-914
John X.....914-928
Leo VI.....928
Stephen VII.....928-931
John XI.....931-935
Leo VII.....936-939
Stephen VIII....939-942
Marinus II.....942-946
Agapetus II.....946-955
John XII.....955-964
Leo VIII.....963-965
Benedict V.....964
John XIII.....965-972
Benedict VI.....973-974
Benedict VII....974-983
John XIV.....983-984
Boniface VII....984-985
John XV.....985-996
Gregory V.....996-999
Sylvester II.....999-1003
John XVII.....1003
John XVIII.....1003-09
Sergius IV.....1009-12
Benedict VIII...1012-24
John XIX.....1024-32
Benedict IX.....1032-44
Gregory VI.....1045-46
Clement II.....1046-47
Damasus II.....1048
Leo IX.....1049-54
Victor II.....1055-57
Stephen IX.....1057-58
Benedict X.....1058-59
Nicholas II.....1058-61
Alexander II.....1061-73
Gregory VII.....1073-85
Victor III.....1087
Urban II.....1088-99
Paschal II.....1099-1118
Gelasius II.....1118-19
Calixtus II.....1119-24
Honorius II.....1124-30
Innocent II.....1130-43
Celestine II.....1143-44
Lucius II.....1144-45
Eugenius III....1145-53
Anastasius IV....1153-54
Adrian IV.....1154-59
Alexander III....1159-81
Lucius III.....1181-85
Urban III.....1185-87
Gregory VIII.....1187
Clement III.....1187-91
Celestine III....1191-98
Innocent III...1198-1216
Honorius III....1216-27
Gregory IX.....1227-41
Celestine IV.....1241
Innocent IV.....1243-54
Alexander IV....1254-61
Urban IV.....1261-64
Clement IV.....1265-68
Gregory X.....1271-76
Innocent V.....1276
Adrian V.....1276
John XXI.....1276-77
Nicholas III....1277-80
Martin IV.....1281-85
Honorius IV....1285-87
Nicholas IV....1288-92
Celestine V.....1294
Boniface VIII..1294-1303
Benedict XI.....1303-04
Clement V.....1305-14
John XXII.....1316-34
Benedict XII....1334-42
Clement VI.....1342-52
Innocent VI.....1352-62
Urban V.....1362-70
Gregory XI.....1370-78
Urban VI.....1378-89
Boniface IX....1389-1404
Innocent VII....1404-06
Gregory XII.....1406-09
Alexander V.....1409-10
John XXIII.....1410-15
Martin V.....1417-31
Eugenius IV.....1431-47
Nicholas V.....1447-55
Calixtus III....1455-58
Pius II.....1458-64
Paul II.....1464-71
Sixtus IV.....1471-84
Innocent VIII...1484-92
Alexander VI..1492-1503
Pius III.....1503
Julius II.....1503-13
Leo X.....1513-21
Adrian VI.....1522-23
Clement VII.....1523-34
Paul III.....1534-49
Julius III.....1550-55
Marcellus II.....1555
Paul IV.....1555-59
Pius IV.....1559-65
Pius V.....1566-72
Gregory XIII....1572-85
Sixtus V.....1585-90
Urban VII.....1590
Gregory XIV....1590-91
Innocent IX.....1591
Clement VIII..1592-1605
Leo XI.....1605
Paul V.....1605-21
Gregory XV.....1621-23
Urban VIII.....1623-44
Innocent X.....1644-55
Alexander VII...1655-67
Clement IX.....1667-69
Clement X.....1670-76
Innocent XI.....1676-89
Alexander VIII..1689-91
Innocent XII...1691-1700
Clement XI.....1700-21
Innocent XIII...1721-24
Benedict XIII....1724-30
Clement XII.....1730-40
Benedict XIV....1740-58
Clement XIII....1758-69
Clement XIV....1769-74
Pius VI.....1775-99
Pius VII.....1800-23
Leo XII.....1823-29
Pius VIII.....1829-30
Gregory XVI....1831-46
Pius IX.....1846-78
Leo XIII.. 1878-1903
Pius X..... 1903—

PAPAGO, pä'pä-gō. An important tribe of Piman stock (q.v.), originally occupying a large portion of Arizona, south of the Gila, and extending across the border into northern Sonora, Mexico. They were missionized by the early Jesuits and Franciscans, and are now practically all Catholic. They are agricultural, industrious, and peaceable toward the whites, but have been compelled to wage constant war with the Apache until a recent period. They carry on an extensive trade in salt, collected from the salt lakes of the region. They were recognized as citizens under the Mexican Government, but their rights were disregarded on the annexation of the territory to the United States, and by the seizure of the best lands and water supplies by the American settlers and land companies, the majority have been rendered homeless nomads. Hundreds of them earn good wages as railroad laborers. They number about 3900, of whom 520 are on San Xavier reservation and 100 at Gila Bend, most of the others being nomadic. The number in Sonora is unknown.

PAPA'IN. A digestive ferment derived from the juice of *Carica Papaya*, a South American fruit tree belonging to the order Papayaceæ. This ferment is a mixture containing vegetable globulin, albumoses, and peptone. It digests all forms of proteid or albuminous matter, whether coagulated or not, and whether the medium in which it works is acid, alkaline, or neutral. It is a rapid solvent of false membrane. Papoid, derived from papain, is serviceable in gastro-enteritis, gastritis, infantile diarrhœa, and fermentative dyspepsia. It has been used locally on diphtheritic membrane, and has been injected into neoplasms with success. It is found in the shops in powder and tablet form, and a glycerole is also made. Papain is not official.

PAPAL GUARANTEES, Law of. A law passed by the Italian Parliament at Florence in 1871, which aimed at making the Papacy and the Italian Government mutually independent. It guaranteed to the Pope the diplomatic privileges of a sovereign power with its own ambassadors and its own court in the midst of Rome; separate postal and telegraphic communications with foreign countries; and an allowance of 3,225,000 francs a year. It allowed further to him and his successors the use of the Vatican and Lateran palaces, and certain other buildings, and precluded all Government officials from entering any of these buildings without permission. It relinquished the royal *exequatur* and *placet*, or the necessity of the King's assent to the publication and execution of acts of the ecclesiastical authority; it exempted the bishops from any oath of allegiance to the Crown, and gave the clergy complete freedom of meeting. It put an end to appeals to the civil courts against acts of spiritual discipline, but, on the other hand, it denied to the Church courts the aid of the civil tribunals in enforcing their decisions. This plan, of which a draft had been found among the papers of Cavour, and which attempted to realize his ideal of 'a free Church in a free State,' was opposed by the Liberals as

leaving the Pope in far too independent a position. It was submitted to the Powers with the view of obtaining international sanction; but this failed through the refusal of England. Partly, perhaps, owing to French influence, the Pope decided to refuse these offers and to ignore the Italian Government completely while remaining in Rome.

PAPAL STATES, or STATES OF THE CHURCH. The name applied to the territory in Central Italy, varying in extent, which until the last half of the nineteenth century was under the temporal sovereignty of the Pope. The earliest origin of this dominion is difficult to assign to a definite year. Although the so-called Donation of Constantine is now known to have been a later invention, there is no doubt that he made many rich gifts to the Church, especially after his victory over Maxentius; the Lateran Palace, for a thousand years the residence of the popes, seems to have been given to them during his reign. Like other bishops, the bishops of Rome acquired by degrees not unimportant political rights; and when the seat of the Empire was removed to Byzantium, it was partly their rich possessions that gave them their great influence in the affairs of Italy. By the time of Gregory the Great (590-604) the Roman See possessed at least twenty-three estates with a total area of some 1800 square miles in various parts of Italy and the adjacent islands, in Southern France, and even in Northern Africa. The beginning of full sovereignty in the modern sense may, however, be said to have come from the presentation of the town of Sutri by the Lombards to the Apostles Peter and Paul in the person of Gregory II. (727). The Lombards were uncertain friends, however, and the popes were obliged to appeal to the Frankish kingdom for aid against them. In 754 Pepin transferred considerable and definite territories to Pope Gregory III., and in the following year, brushing aside by conquest any claims which either the Lombards or the Byzantine Emperor made to these lands, placed the Pope in undisputed possession of them. Charlemagne increased them, until they extended from Luna, near the present Lucca, to Capua, including the Duchy of Rome, the Pentapolis, Emilia, and the Exarchate of Ravenna, or nearly the whole of Central Italy.

This sovereignty, though attacked during the troubles of the tenth century by the Italian factions, increased gradually during the eleventh and twelfth. In 1014 the Emperor Henry II. resigned half of Tuscany into the Pope's hands; Leo IX. received the overlordship of Benevento from Henry III. in 1052, and the principality came into the full possession of the Holy See in 1077, on the extinction of the family which had ruled it. In 1115 the Countess Matilda of Tuscany left the Pope her fiefs of Parma, Modena, Reggio, and Garfagnana, and part of Mantua. They were, however, seized by the Emperor, and only a part of Southern Tuscany actually came into the Pope's hands. In these times, in any case, the power of the Pope was little more than a feudal suzerainty over a number of petty princes or over cities with their own government, who paid tribute to the popes and were bound to assist them with a military force in case of need. In France, Gregory X. gained the Comtat Venaissin from Philip III. in 1274, and Clement VI. bought the town of Avignon in 1348. During the Avignon period, however (1309-76), the temporal sovereignty of the popes over their Italian territories was menaced or weakened by the ambition of the great families, and Cola di Rienzi even succeeded for a time in shaking it off from Rome itself. In the sixteenth century the popes entered so largely into the political movements of Europe, and were of such importance to the maintenance of the balance of power, that prudent statesmanship was able to increase their territory largely. Sixtus IV. at the end of the fifteenth century established his jurisdiction over Romagna; additions were made of Bologna in 1512, Ancona in 1532, Camerino in 1545, Ferrara and Comacchio, the possessions of the House of Este, in 1598, Urbino in 1631, Castro and Ronciglione, the last additions, in 1649.

Great changes began with the end of the eighteenth century. In 1768 the Bourbon rulers of Naples seized Benevento and Pontecorvo, and in 1783 dissolved altogether the connection with the Roman See which had existed for more than seven centuries. Avignon and Venaissin were occupied from 1768 to 1774, as they had been twice in the preceding century, by the French Bourbons, and in 1791 passed under the jurisdiction of the French Republic. By the Treaty of Tolentino (1797) Pius VI. was obliged to resign the three legations of Bologna, Ferrara, and Romagna into Napoleon's hands, and a year later the remaining territory was seized and erected into the Roman Republic. This was overthrown by the Second Coalition in June, 1799; on July 3, 1800, Pius VII. entered Rome, which had been held by the Neapolitans, and reëstablished the old constitution in his States, now deprived of Romagna, Bologna, and Ferrara. The French again took possession of them, and in 1809 incorporated them with the Empire, Rome being reckoned as its second city. The Congress of Vienna restored the States of the Church, now embracing the marches of Ancona and Camerino, the duchies of Benevento and Pontecorvo, and the legations, except a part of Ferrara, which Austria retained. In 1831 and 1848 there were risings against the Government. The former was suppressed by the aid of an Austrian army; the latter assumed such proportions, even in Rome itself, that Pope Pius IX was forced to flee to Gaeta, while Rome was proclaimed a republic. He was restored by the arms of France in 1849. The Austrians held the legations for the Pope until 1859, and the French occupied Rome in his behalf (except for a part of 1867) until 1870. In July, 1859, on the withdrawal of the Austrian troops, the Romagna threw off the Papal authority and declared its annexation to the Kingdom of Sardinia, or, as it was to become a few months later, of Italy. After the defeat of Lamoricière, the Papal general (1859), Umbria, Urbino, and the Marches were annexed by Victor Emmanuel; and the isolated possessions of Benevento and Pontecorvo shared the same fate. In October, 1870, the French army having been withdrawn in July, the remnant of the Papal States voted for union with the Kingdom of Italy. It was the original intention of Victor Emmanuel's Government to leave the part of Rome known as the Leonine city under the Pope's control as a compromise; but it was rejected equally by the Pope and by the inhabitants, and the Pope's jurisdiction was re-

stricted within the limits of the Vatican, outside of which, as a protest against the legality of the Italian occupation, he has never set foot since 1870. Roman Catholics generally, while of course not considering the temporal power as in any way essential, yet regard it as very expedient for the proper exercise by the Pope of his high functions that he should be independent and not the subject of any temporal ruler. This is maintained not only on theoretical grounds, but as demonstrated historically by the events of the Avignon captivity and by more than one incident of the period since 1870. Consult: Manning, *The Temporal Power of the Pope* (London, 1871); Hagelüken, *Die weltliche Macht des Papstes* (Frankfort, 1868); Döllinger, *Papstthum und Kirchenstaat* (Munich, 1861); Hergenröther, *Der Kirchenstaat seit der französischen Revolution* (Freiburg, 1860); Stillman, *The Union of Italy* (Cambridge, 1898). See PAPACY; ITALY; PAPAL GUARANTEES, LAW OF.

PAPAV'ERA'CEÆ (Neo-Lat. nom. pl., from Lat. *papaver*, poppy). THE POPPY FAMILY. A natural order of dicotyledonous plants, mostly herbs or half shrubs, and usually with a milky or colored juice. The leaves are alternate, without stipules; the flowers solitary on long stalks; the fruit pod-shaped or capsular; the seeds numerous. In several the fruit is a capsule opening by small pores just under the expansion formed by the stigmas. In this way the seeds are well protected and only escape when shaken by the wind or other agencies. The order is distinguished for narcotic properties. Opium (q.v.) is its most important product. The juice of celandine (q.v.) is very acrid. A number of species are used in their native countries for medicinal purposes. The seeds yield fixed oil, which, with the exception of that obtained from Argemone Mexicana, is bland. The flowers of many species are large and showy, most frequently white or yellow, sometimes red. Several kinds of poppy and Eschscholtzia are frequent in gardens. There are in all about 200 species, natives of tropical and temperate climates. The chief genera are Hypecoum, Eschscholzia, Chelidonium, Glaucium, Papaver, Dicentra, Corydalis, and Fumaria. See POPPY.

PAPAW' (from Sp., Port. *papaya*, from Malabar *papaiamaram*, the native name), *Asimina triloba*. A small American tree or shrub of the natural order Anonaceæ, with alternate entire leaves and lateral or axillary nodding flowers. The fruits are variable in size, ranging from two to six inches in length and from one to two inches in diameter; flesh soft, sweet, and buttery; rind thin and adherent; seeds large, kidney-shaped, and numerous. While the papaw abounds in clearings and pastures from Pennsylvania southward, it is seldom met with in cultivation outside of parks and ornamental grounds. The fruits are found in season in several American markets, where they meet with ready sale. The tropical papaw, or melon tree, is a species of Carica.

PAPÉITI, pä'pä'ē'tē'. The capital of the French possessions in the eastern Pacific. See TAHITI.

PAPER (OF., Fr. *papier*, from Lat. *papyrus*, from Gk. *πάπυρος*, *papyros*, papyrus). Although the word 'paper' is derived from 'papyrus' (q.v.), papyrus is not a paper at all, and the beginnings of the paper industry are not traced back to it, but to the genuine paper made by the Chinese from very early times. From the Chinese it spread to other races, and was probably brought into Europe during the twelfth century through the Moors into Spain, and at the time of the Second Crusade into Italy. About the year 1150 a paper mill was started at Fabriano, Italy, which became the principal centre for paper-making, and this region continues the manufacture to the present day. From Italy the art spread to France and Germany, somewhat later to England, where it was not well established until the Revocation of the Edict of Nantes in 1685 sent many French paper-makers into exile to England and America. In 1690 the first paper mill in America was built by William Rittenhouse at Roxborough, near Philadelphia. The first paper mill in New England was built by a company to which was granted by the Governor and Legislature in 1728 the sole privilege of making paper in the Province of Massachusetts for ten years. In 1730 the manufacture of paper was begun by this company, and specimens of paper were shown to the Legislature.

PAPAW.

Up to the beginning of the nineteenth century, while machinery was used to reduce the rags to a pulp, the formation of the sheet of paper was done entirely by hand, sheet by sheet, as described below. About 1798 Louis Robert, a workman in the mill of Didot at Essonne, France, patented an invention for making paper in an endless web, but it was not put to practical use till developed in England by Henry and Sealy Fourdrinier, who spent and lost a fortune perfecting the machine. They are properly considered the founders of modern paper-making, and their machine is universally known as the Fourdrinier machine. So well was their develop-

PERSIMMON TREE (Diospyros Virginiana).

PAPAW OR MELON TREE (Carica Papaya).

ment work done that the early machines differ in minor details only from the most modern machine running to-day.

Earliest Process of Manufacture. The method of manufacturing paper by hand from the inner bark of the paper mulberry, as practiced to-day by the Japanese, probably represents the method in vogue from the very earliest times. It is of interest not only on account of its antiquity, but because it presents in outline all other methods, which merely are adaptations of the processes here described. A sheet of paper is an artificially felted web of vegetable fibre, purified of perishable materials, so that the remaining fibres are more or less pure cellulose (q.v.). The process may be described as collecting the raw material, cleaning it by boiling with lye, macerating it to a fine pulp, diluting with water, forming a sheet on a porous surface (that the water may drain off), and drying the sheet of paper thus formed. The Japanese strip the paper mulberry of its bark, soak it in water till soft enough to strip the outer bark, then separate the inner bark, dry in the sun, and boil with lye obtained by leaching wood ashes. After being well washed, the bark is now beaten into pulp by four men seated around a board of hard wood on which the bark is placed. The men pound with long wooden mallets and turn out each day about 80 pounds of pulp per man. The fibre is now mixed with sufficient water, and the sheet of paper formed on a sieve made of fine strips of bamboo. A wooden frame is fitted on the sieve to hold the right amount of liquid pulp. This elevated border is called in Europe the 'deckel,' and prevents the pulp from spreading beyond the limits of the sheet. After dipping the sieve into the vat of pulp, the paper-maker dexterously shakes the mold in all directions as the water drains off, thus felting the fibres in all directions and making a strong sheet. The sheets are then spread out on a board and dried in the sun.

The European method of making paper by hand differs in several respects from the Japanese. The raw material used (originally linen rags) is too tenacious to be reduced to pulp by hand power, and the earliest European mills used a sort of trip-hammer or pestle driven by a water wheel. This in turn was superseded by the modern beating engine or Hollander, invented by the Dutch in the latter part of the seventeenth century, as described below. The sieve used, instead of being made of bamboo, is of wire cloth, with a movable edge or deckel. The workman after forming the sheet removes the deckel, turning the damp sheet onto a sheet of woolen felt. A pile of these sheets, alternate paper and felt, is called a 'post,' and is placed in a press to remove the water. The sheets are afterwards hung up in a loft to dry, and finished by sizing with glue or gelatin, and smoothed by pressure or calender rolls. Hand-made paper always has four rough edges, while machine-made paper has only two. These are usually trimmed off unless an imitation of hand-made paper is wanted.

Raw Materials. The preparation of any raw material for use as paper stock consists essentially in isolating the cellulose in the form of fibres of as great length as possible. As cellulose is the structural base of all plants, theoretically any plant might furnish the paper-maker with material for his mill. It becomes, therefore, a question of cost of producing the pure cellulose, and quality of the product. The earliest plant used was the paper mulberry, whose fibres are very easily separated, and a fairly pure cellulose obtained by simply boiling with lye. As this plant does not grow in Europe, it is not used in modern paper-making. The chief material used up to the middle of the nineteenth century was cotton and linen rags. These are already reduced to nearly pure cellulose by the processes of textile manufacture, and cleaning and boiling with an alkali is all that is needed to prepare the stock for pulp. Wood is the raw material of most importance to the paper-maker to-day, and esparto grass (alfa) is used in England on a large scale. Straw, waste paper, old rope, jute butts, hemp, etc., are also used. The different processes of reducing the material to a suitable fibre will be considered later.

Process of Manufacture by Machinery. Whether for hand-made or for machine-made paper, the preparation of rags for pulp may be divided as follows: (1) cleaning; (2) boiling; (3) washing; (4) bleaching; (5) beating or reducing to pulp. The preparation of substitutes for rags is practically the same except that the boiling process is more drastic, varying with the substance used.

(1) *Cleaning.*—Rags are received at the mill in bales more or less sorted into white, colored, linen, cotton, canvas, etc., but need, for the finer sorts of paper (in which alone rags are now used at all), a thorough dusting and further sorting by hand. The duster may be of various forms, and removes dust and foreign substances by vigorous mechanical methods. The sorting is done by girls who stand before tables covered with wire screens through which dust and dirt sifts. The girls cut off buttons, rubber (a great curse to the modern paper-maker, as it does not bleach and appears in the paper as black specks, besides sticking to rolls and clogging the straining screens), and other foreign substances, and sort the rags accurately into different grades. A further dusting and chopping into pieces a couple of inches long make the rags ready for boiling.

(2) *Boiling.*—The rags are packed in a large horizontal boiler, called the 'rotary.' This is provided with manholes for the admission and discharge of the rags and lime, and is mounted on hollow trunnions through which steam is admitted. To clean the rags from all fatty, colored, and non-cellulose impurities, a solution of lime is used, and the rags cooked and slowly rotated under steam pressure for several hours, the amount of lime, pressure, and time of boiling varying according to circumstances. When sufficiently cooked, the steam and liquor are blown off and the rags dumped out by slowly revolving the rotary with the manholes opened. The rags are now of a brown color, and most of the impurities have been saponified, combining with the lime to form insoluble compounds which can be washed away, or, in the case of colors, reduced to simple colorless compounds.

(3) *Washing.*—The washing or beating engine is shown in the cut. It is also called the Hollander. It consists of a wooden or metal tub 10 to 15 feet long, with rounded ends (see cut), in the centre of which is a partition (5)

called the 'mid-feather'; a roll (C) is provided with knives, and revolves rapidly over a bed plate (B) of similar knives. The distance between the bed plate and the roll is regulated by raising or lowering the supports of the roll with a wheel and screw. The rags after passing between the bed plate and the roll flow down

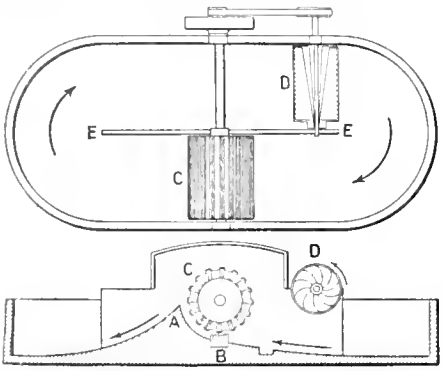


FIG. 1. PULP-BEATING ENGINE.

the 'backfall' (A) and around the mid-feather back to the starting point, as indicated by arrows. The washing engine is provided with a washing cylinder (D), which is so made that as it revolves it scoops up the water, which flows out through its axis, the rags being kept out by a fine wire cloth surrounding the cylinder. The rags to be washed are put into the washing engine with enough water, the roll being raised so that the rags pass around freely without being beaten into pulp, as otherwise the dirt would be ground into the fibre. A large quantity of water is admitted, which is removed by the drum washer, as described above, and the rags are in this manner rapidly cleaned. The roll is now lowered gradually, and the rags slowly macerated, losing their characteristics of textiles, and being finally resolved into single fibres of varying lengths. When the washing is completed, the washing cylinder is raised out of the beater and the supply of water cut off. The beating process is then continued a little longer till the pulp reaches the stage called half-stuff, the practice varying in different mills.

(4) *Bleaching.*—The pulp is now as white as it can be made without bleaching, and is a light gray if medium grade white and colored rags were used. The addition of a solution of chloride of lime (bleaching powder), decomposed by sulphuric acid, bleaches the pulp to a creamy whiteness. In America the bleaching is done in the washing engines, but in Europe a separate tub is often used. In place of chloride of lime, a solution much used in France is prepared by electrolysis of magnesium chloride. After bleaching, the pulp is emptied into the drainers, large chambers with floors of porous tiles, where the moisture and surplus bleach drain off. The pulp is left some days in the drainers, till it is nearly dry. In Europe, in place of drainers, the pulp is usually dried by making up into thick sheets of paper on a machine similar to the wire of the Fourdrinier machine called a *pressepâte*.

(5) *Beating.*—The half-stuff is next put into the beating engines, which are similar to the washers, but have no washing-drum, and the knives are arranged to macerate the pulp faster. At this point the loading materials, color, and sizing are added, and if various fibres are used, such as rag, wood fibre, or esparto, they are mixed here, while the half-stuff is being reduced to the very fine condition required for making into paper. Most papers contain a filler, usually china clay (kaolin, q.v.) or sulphate of lime ('pearl hardening'). This fills the pores, giving a more even printing surface, besides adding to the weight. As paper is usually sold by the pound, the latter consideration is not without its influence, the loading sometimes amounting to 33⅓ per cent. An addition of 10 per cent. of mineral is not considered an adulteration. Bleached pulp has a yellowish cast, and to obtain a pure white a little blue is added, and papers that are colored in the pulp are prepared at this point. Sizing is added to prevent the absorption of ink. Unsized (or 'water leaf') papers absorb water readily and cannot be used for writing with a pen. The sizing is of two kinds, vegetable (rosin) size, added at this stage of manufacture, and animal (glue) size, which is applied externally after the paper is made. The accompanying plate (Fig. 2) shows the beating engines in a 'news' mill at Rumford Falls, Maine. A boy is 'furnishing' the second engine, putting in chemical fibre, while the

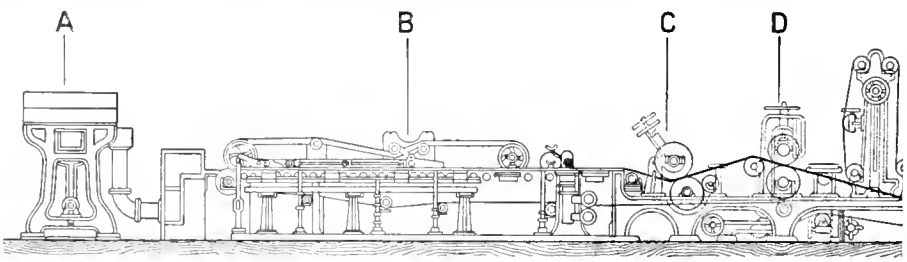
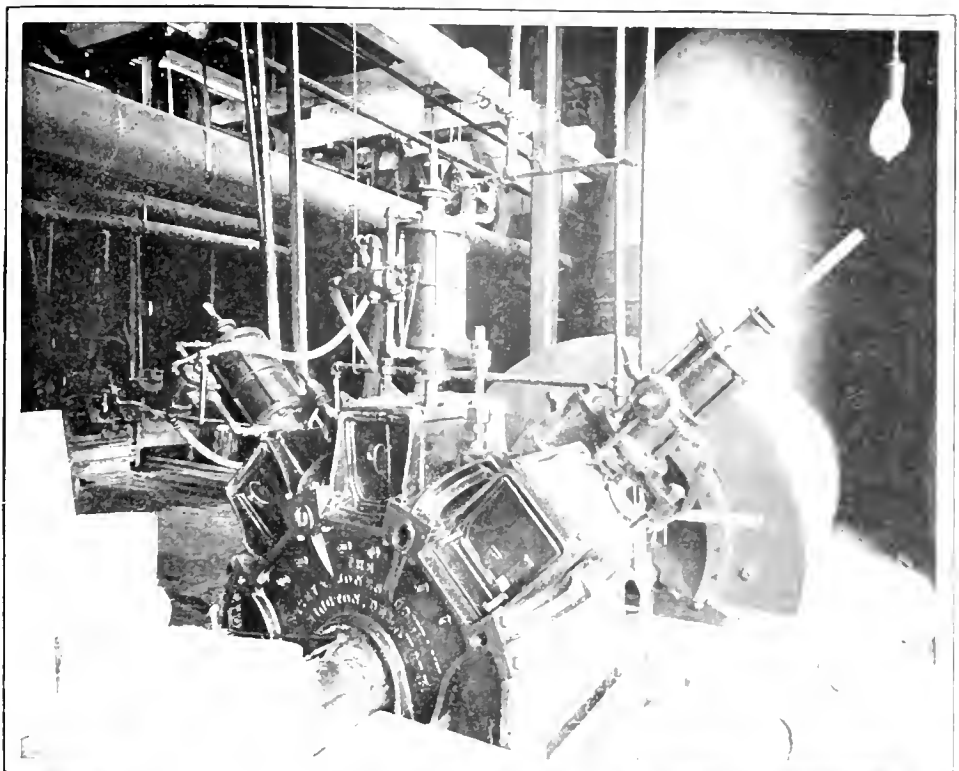


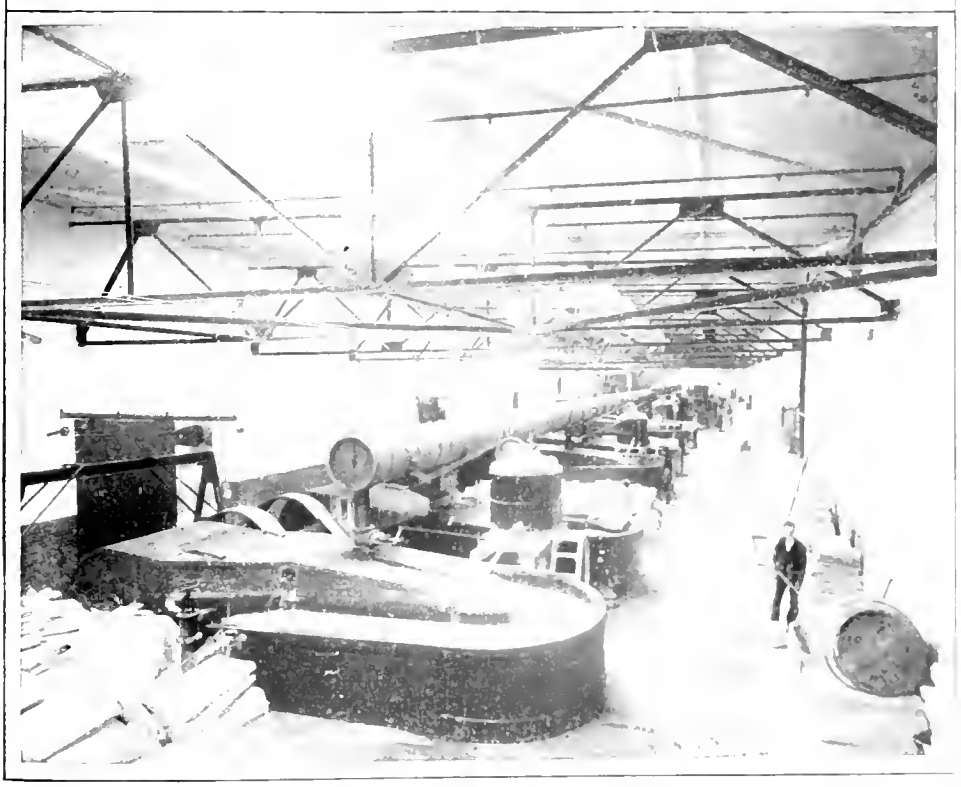
FIG. 2. FOURDRINIER MACHINE IN SECTION.

ground wood is run in from the large pipe above. On the other side is seen a man getting out china clay from a cask.

Rosin size is prepared as follows: A rosin soap is made by dissolving rosin with caustic soda or potash; this is added to the pulp in the beating engine and precipitated on the fibres by the addition of a solution of alum or sulphate of alumina. Paper thus sized is called engine-sized or rosin-sized paper, as distinguished from 'tub-sized' or animal-sized, which will be described later.

The pulp may be beaten fine enough in the beating engine, but the practice in this country





1. WOOD-PULP GRINDER AT RUMFORD FALLS, MAINE.
2. BEATING ENGINES AT RUMFORD FALLS, MAINE.

is to dump it into a 'stuff chest,' a large circular receptacle, with a horizontal agitator to keep it from settling, and then to pump it through a so-called 'Jordan' or refining engine into a second stuff chest, whence it is pumped to the Fourdrinier machine.

THE JORDAN ENGINE is a most successful American invention, in universal use in the paper mills of America, but practically unknown in Europe, in spite of its large saving of time, space, and power. It was invented in 1862 by Joseph Jordan of Paterson, N. J., who never benefited financially from the invention, and is now supported in poverty by the paper-makers of America. The 'Jordan' consists of a stationary hollow cone mounted with knives on the inside which fits over a solid rapidly revolving cone mounted with similar knives on the outside. The pulp passes between these cones, and the knives can be brought close together or separated with great accuracy, so that the degree of fineness of the pulp can be adjusted.

THE FOURDRINIER MACHINE consists of the following parts: A, the screens; B, the wire, with dandy roll, deckel straps, and suction boxes; C, the couch rolls; D, the first press; E, the second press; F, the driers; G, the calenders; H, the reel; and I, the slitter.

A. *The Screens.*—From the second stuff chest the pulp, which is now diluted with a large amount of water, flows through sand settlers and regulating gates to the screens. These consist of brass plates with a large number of longitudinal V-shaped slits cut in them, the opening being very small, only a few thousandths of an inch. A continuous jarring is given to these plates, which forces the fine pulp through the slits, but the lumps and impurities are retained. In some forms of screen a vacuum pump is used combined with an oscillating motion of the screens, which keeps the pulp flowing back and forth, preventing the clogging of the slits.

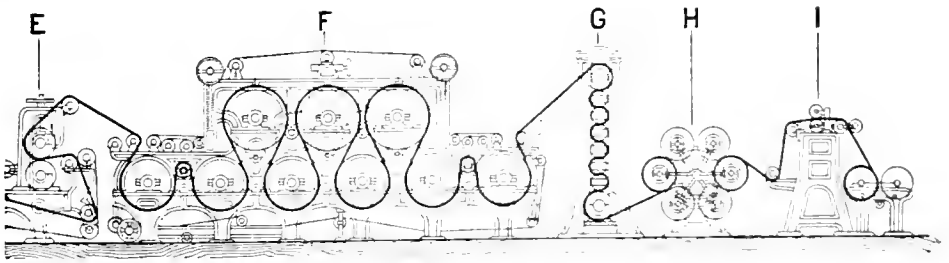


FIG. 2 FOURDRINIER MACHINE IN SECTION.

B. *The Wire.*—The strained and purified pulp flows over an apron onto an endless traveling wire cloth, the mesh of which is 60 to 90 threads to an inch. The wire is supported perfectly level on a great many small rollers (the 'table rolls'), under which is a shallow wooden box, the 'save-all,' into which much of the water runs, leaving the pulp on the wire. The water in the 'save-all' contains much pulp and is used over again. The boundary of the flow of pulp on the sides is made by endless rubber bands, called deckel straps, which travel with the wire. These are adjustable so that varying widths of paper may be made. The frame supporting the wire receives a lateral motion, which greatly assists in the felting of the fibres into a strong sheet. The forward motion of the wire tends to arrange the fibres in the same direction, and the side shake is necessary to offset this tendency, giving strength in both directions. Notwithstanding, it is easy to tell by tearing which way a sheet of paper was made on the machine. The water drains rapidly away from the pulp, assisted by two or three 'suction boxes' under the wire, which are connected with an air pump and exhaust the water much faster than would otherwise be possible. At this point, between the first and second suction boxes, is situated the 'dandy roll,' a light cylinder covered with wire, which rests on the upper surface of the moist paper, giving it the impression of whatever design is on it. 'Wove' paper has both sides impressed with the fine woven wire; that is, the dandy roll is covered with the same wire as the paper is formed on. In *laid* paper, on the other hand, the dandy is covered with parallel wires, with a cross wire at intervals. Water marks are impressed in the paper by affixing the required design on the dandy roll. A false water mark is sometimes made after the paper is partly dried by passing between rolls engraved with a design.

C. *Couch Rolls.*—At the end of the wire (that is, where it turns down over a roll to return to the starting point) are the 'couch' rolls, covered with felt, through which the wire passes bearing the web of paper. These rolls press the water out still more, and consolidate the fibre, giving it strength to cross alone the gap between the wire and the felt of the first press roll. These rolls correspond in function to the pressure applied to the 'post' of alternate sheets of damp paper and felts in hand made paper.

D and E. *The Press Rolls.*—An endless woolen blanket (the 'felt') supports the tender web of paper through a pair of highly polished brass rolls under considerable pressure, giving the upper side of the sheet a smooth surface, and leaving the impress of the felt on the under side. From the first press, D, the sheet runs *under* the second pair of rolls, E, and back through them in the *reverse* direction, thus smoothing the *other* side of the sheet and giving as even-sided results as possible.

F. *The Driers.*—The paper is now formed and it only remains to dry it. The driers are a series of steam-heated metal cylinders, two to four feet in diameter, arranged in one, two, or three tiers. The paper is carried nearly round each in turn, and on to the next, being held to the hot surfaces by an endless blanket, usually of cotton. Sometimes there are smoothing rolls

when the paper is partly dried. The size and number of driers determine how fast a paper can be run. With a given machine thin papers can be run (and dried) very fast; thick ones slowly.

G. *The Calenders.*—After being thoroughly dried the web of paper is passed through a 'stack' of smooth chilled iron rolls, which by their own weight, and pressure applied by screws or weights, smooths the paper and produces what is called 'machine finished' paper, as contrasted with 'supercalendered' paper, described farther on. It is now wound on a reel.

H and I. *The Reel and Slitter.*—After being wound on a reel the paper is passed through the slitter, the rough outside edges trimmed, and if necessary the single web slit into any required widths. It is then rewound and is ready for shipment, if intended for printing in the roll or for coating; or for supercalendering, sheeting, and packing.

The Fourdrinier machine makes automatically an endless web of paper from 60 to 160 inches wide at a speed of 10 to 400 feet per minute. The plate shows the reels, calenders, and driers of one of the largest machines in the world, 160 inches wide, belonging to the International Paper Company at Rumford Falls, Maine. It can run at a speed of 300 feet per minute and produces 64,000 pounds of paper in 24 hours.

Supercalenders. Much book paper requires a high finish, that is, a very smooth surface, and this is given by passing it between alternate iron and compressed paper rolls under great pressure. These machines are called the supercalenders. It is then sheeted, counted into reams of 480 or 500 sheets, and packed in cases or bundles.

Animal Sizing and Loft Drying. The finer grades of writing papers are not finished as here described, but when partly dried are passed through a vat of gelatin (glue) in solution, the excess squeezed off by rollers, and either slowly dried by passing over a large number of hollow drums with fans inside, or cut in sheets, and hung in lofts to dry in the manner employed for hand-made paper.

The following are the main differences in the preparation of rag substitutes from that given above:

Esparto grass comes from Spain and Africa, and is very largely used in England. The grass is cleaned, dusted, and boiled with caustic soda under pressure, a so-called vomiting boiler being usually used; it is then washed and bleached in much the same manner as rags. It gives a white fibre of fair strength.

Straw is used largely in the United States, chiefly for strawboard, and not reduced to a pure fibre. Its characteristics are similar to esparto, but it is more difficult to reduce to pure cellulose, owing to the silica it contains, requiring a stronger alkali and higher pressure in boiling.

Wood Pulp. There are two kinds of wood pulp used in paper-making, *mechanical pulp* or ground wood, and *chemical fibre*. Of the latter there are three processes of manufacture, the soda process, the sulphite, and the sulphate.

Ground wood is made by pressing blocks of wood obliquely (across the grain) against rapidly revolving grindstones, a stream of water carrying off the product, which is not chemically changed, and has very little fibre or strength. It is used very largely, however, for cheap newspaper, chiefly in connection with chemical fibre to impart greater strength. The plate (Fig. 1) shows a pulp-grinder at Rumford Falls, Maine, the stone being coupled directly to a turbine water wheel. It will be seen that there are three 'pockets,' in which blocks of wood are placed and pressed simultaneously against the stone. The pulp is then screened to remove lumps, bleached if necessary, and either run directly into the beaters if made into paper at the same mill (as at Rumford Falls; see plate, Fig. 2), or made into thick sheets by a machine similar to the cylinder paper machine described below. It is usually sold in a moist state. Paper containing ground wood turns yellow when exposed to the light, and becomes brittle. A solution of sulphate of aniline turns ground wood fibre a bright yellow, the intensity of the color giving a rough guide to the percentage of ground wood in the paper.

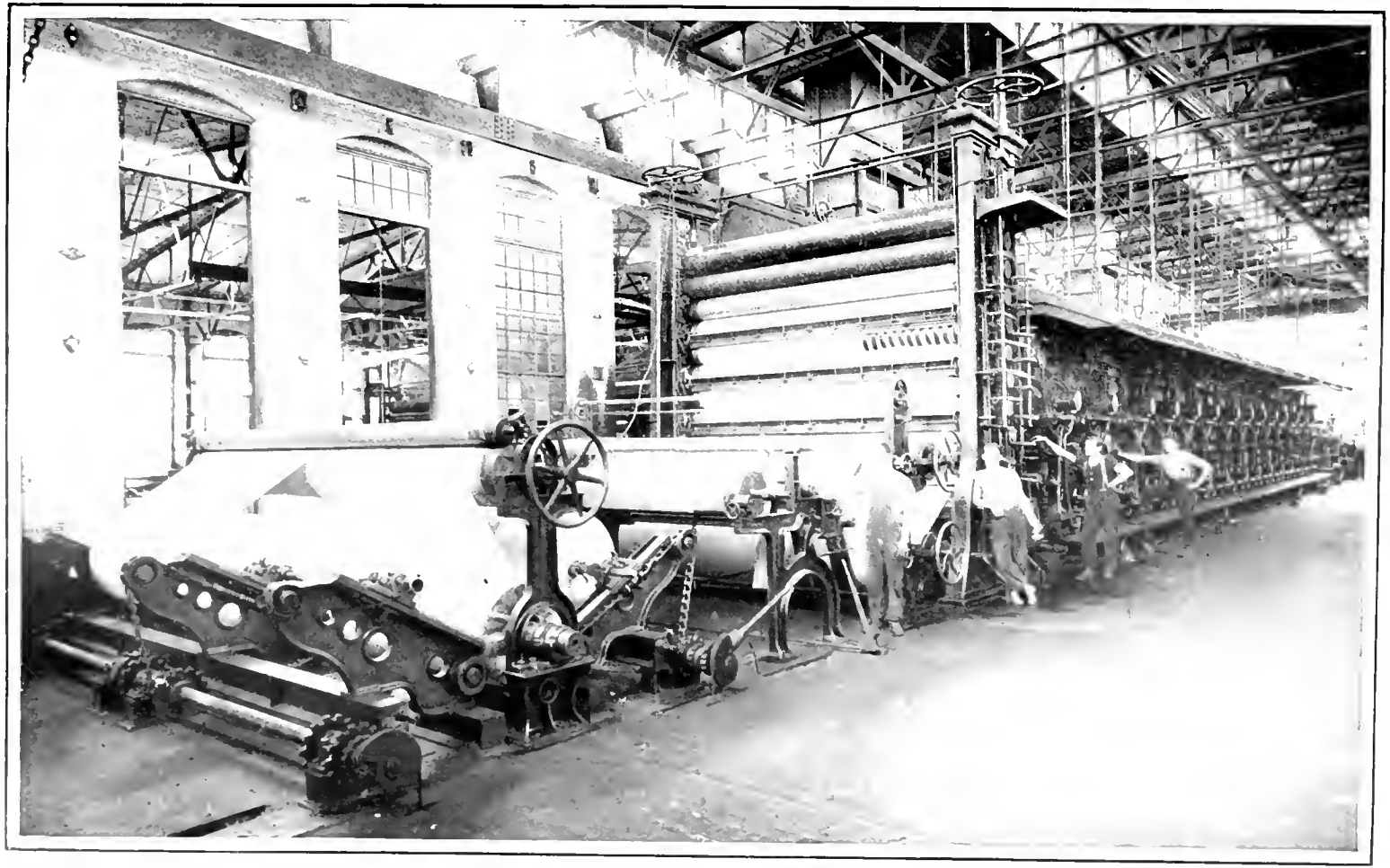
Chemical Wood Pulp. The oldest process of freeing cellulose from the incrusting woody matter, producing a material for making white paper, is the soda process, patented by Watt & Burgess in England in 1854. A soft wood, usually poplar in America, pine in Europe, is barked, chipped across the grain into small pieces, and cooked under steam pressure with a solution of caustic soda. The alkali dissolves everything but the cellulose, and after washing and bleaching a soft white fibre of good quality is produced, of little strength, but very useful to supplement other fibres.

The *sulphite process* is apparently an American invention, the first patent being granted in 1867 to B. C. Tilghmann. He used sulphurous acid to produce pure cellulose, and while this is the base of the modern process, it was not brought to a practical success till bisulphite of magnesium or calcium was used instead. Mitscherlich in Germany brought the process to a commercial basis, and of late years it has developed to very large proportions. Various modifications of the process are used, but in all of them the wood, properly barked, chipped, and dusted, is digested under steam pressure in a solution of the bisulphite, washed, and bleached if necessary. 'Sulphite' fibre has good strength and color, and much of it is used unbleached.

The *sulphate process* is not used in America, but produces a very good pulp at a higher cost than sulphite. It is similar to the soda process in theory, but sulphate of soda is used. An objection to it consists in the offensive odor of the by-products.

In the different processes of treating wood various forms of boilers are used, stationary, rotary, cylindrical, and spherical. They have to be lined to resist the action of the chemicals, and lead or cement is commonly used for this purpose. A large factor in the successful conduct of pulp manufacture lies in recovering the chemicals from the spent liquor. In the soda process the liquor is evaporated and finally incinerated in a furnace from which nearly all the caustic soda used is recovered. There are similar economies practiced in the other processes which not only save valuable chemicals, but prevent the pollution of streams.

The Cylinder Machine. While almost all pa-



PAPER MACHINE AT MILL OF INTERNATIONAL PAPER CO., RUMFORD FALLS, MAINE

per, ordinarily so called, is made on the Fourdrinier machine, a very large class of heavy papers, cardboards, strawboard, news board binders' board, and the like, as well as most tissue paper, is made on a different machine. Instead of the horizontal wire on which the pulp flows, the wire is fastened around a cylinder which dips in a vat of pulp, and as it revolves a film of pulp comes up with it, the water running off through the wire. As there is no lateral shake, the paper is not felted as well as on the other machine, and has less strength across the web. It is easy to arrange several vats and cylinders so that the sheets shall unite, and in this way very heavy boards are made. The rest of the machine, press rolls, driers, etc., is the same as described previously. While, as already stated, the product of the cylinder machines is not so important, there are in the United States nearly as many of these in operation as Fourdrinier machines.

Coated Papers. A large amount of paper is given a surface coating of various substances after it leaves the paper mill proper. The process of coating is as follows: The paper is fed in a continuous roll to a rotary brush which applies the coating on one side. Other brushes spread the material evenly, and it is then hung from sticks in festoons in a steam-heated room. The sticks rest on moving racks which pass the festoons slowly down the room. When dry the paper is rewound and calendered, glazed, or embossed. If it is to be coated on two sides, it is passed through the machine a second time and the other side coated. A patented process for coating both sides at once is in use, but is only suitable for a cheap product.

Coated book paper (used for illustrations of the better sort where a very smooth surface is needed to reproduce every line and shading of the picture) is coated with clays and glue or casein, and the necessary smoothness obtained by calendering in a machine similar to the supercalender described above, but having compressed cotton rolls in place of paper ones. Lithographic paper is usually coated on one side only, and is used for printing from stones. See Lithography.

Glazed papers are chiefly used for covering paper boxes. They are coated on one side only and given a very high glossy surface by the *friction calender*. This consists of a top roll of polished iron heated by steam revolving at a much higher speed than the roll below, which is made of compressed cotton. The paper as it passes between these rolls is smoothed as if a hot iron were passed over it. Colors are given to the coating, various pigments being mixed with the clay; and the high lustre is obtained by using beeswax or carnauba wax in the coating mixture. Many other fancy effects are obtained by coating and embossing paper.

Wall paper is printed in various colors and designs from paper in the roll, and is often embossed.

Manila Paper. Originally the wrapping paper called manila paper was made of manila hemp, jute, old rope, and other substances having a strong fibre. Since the introduction of sulphite fibre the ordinary manila wrapping paper of commerce is made wholly of wood, while the strong paper made of old rope and other strong materials is called rope manila.

Papers may be classified as follows: (1) Writing papers, comprising bond papers, ranging from the best bank note and stock certificate to greatly inferior grades, bond in nothing but name, ledger papers, for bookkeeping and other fine writing purposes, linen papers, usually with rough surface and laid water mark. Writing papers are known in the trade as 'flat' papers, as opposed to printing papers, which used to be folded in quires, but now are also flat and almost never folded. (2) Book papers. (3) Newspaper usually largely made of ground wood. (4) Wrapping paper, rope manila, manila, bogus manila, etc. (5) Tissue, blotting paper (unsized), cover papers, etc. (6) Boards of all sorts, strawboard, box board, news board (made from old printed newspapers), bristol board, etc. Pulp is used for a great many purposes besides making into paper. It is waterproofed and pressed into pails and many other shapes. It is used for the inside of car wheels.

Sizes. Formerly very many names were in use to designate different sizes of papers, but now they are largely obsolete, especially in America, and standard sizes are being more and more superseded by special orders of odd sizes. The names for the sizes of writing papers are largely the same in the United States and in England, but the sizes differ slightly. A few of the most common are given below, with the size of both countries:

	In United States	In England
Cap	14 x 17	
Demy	16 x 21	20 x 15½
Folio	17 x 22	
Medium	18 x 23	22 x 17½
Double cap	17 x 28	
Royal	19 x 24	24 x 19¼
Super royal	20 x 28	27 x 19¼
Imperial	23 x 31	30 x 22
Atlas	26 x 33	34 x 26
Double elephant	27 x 40	40 x 27

Statistics. The United States census of 1900 shows a very rapid growth of the paper industry since 1890. While the number of mills did not greatly increase, the value of the product, the tonnage, and the capital invested nearly doubled. The amount of spruce wood consumed each year is so great that unless regular methods of forestry are soon introduced, this source of supply will be cut off. In 1900, 76 per cent of all the wood used in the United States was spruce, and the consumption was 1,500,202 cords. Out of a reported total cost of all materials of $70,530,236, only $13,002,002 went for rags, which were the only material available fifty years ago.

Number of Mills in Operation in 1900

Fourdrinier	[illegible]
Cylinder	[illegible]
Total	[illegible]
Product [illegible] in rolls	474,572 [illegible]
in sheets	[illegible]
Total	[illegible]

Bibliography. Cross and Bevan, *A Text Book of Paper Making* (London, 1900); Beveridge, *Paper Maker's Pocketbook* (ib., 1901); Watt, *The Art of Paper Making* (ib., 1890); [illegible]

Little, *The Chemistry of Paper Making* (New York, 1894); section on "Paper and Pulp," in *Twelfth Census of the United States*, vol. ix., Manufactures, part iii. (Washington, 1902); Mierzinski, *Handbuch der Papierfabrikation* (Vienna, 1886); Hofmann, *id.*, (2d ed., Berlin, 1886-98; English trans., New York, 1894); Kirchner, *Das Papier* (Biberach, 1897-99); Schubert, *Die Praxis der Papierfabrikation* (Berlin, 1898); id., *Die Papierverarbeitung* (ib., 1900-02); and Blanchet, *Essai sur l'histoire du papier et de sa fabrication* (Paris, 1900).

PAPER-BOOK. In the English law, a book containing copies of all the pleadings and an abstract of all the facts necessary to a complete understanding of a case. A paper-book is only required to be filed with the court where the facts are agreed upon or have been determined and the question is one of law only. Where the argument is before a court of original jurisdiction the facts must have been agreed upon or admitted by the pleadings. Where a case is appealed the paper-book corresponds to what in the United States is usually called the 'case and exceptions.' See APPEAL; CASE; PLEADING; PRACTICE.

PAPER-HANGINGS, or WALL PAPER. A name applied to the webs of paper, *papiers peints* of the French, usually decorated, with which interior walls are often covered. Paper-hangings appear to have been used by the Chinese at an early period, but were not introduced into Europe, to any extent, before the eighteenth century. Hangings of canvas, painted to imitate tapestry, were extensively used during the fifteenth and sixteenth centuries. The well-known "Triumph of Julius Cæsar," by Mantegna, at Hampton Court, England, is simply a consecutive set of such hangings. During the sixteenth and seventeenth centuries a thriving business was done in Italy and Spain (particularly at Cordova) in the manufacture of hangings of leather variously stamped and embossed, and from these countries the art was carried into France and England. At first the wall papers produced were imitations of the tapestries, velvets, and leather hangings that for many centuries had been used as wall decorations. But gradually independent designs and effects have been introduced, especially in America. In Europe the costliest wall papers are still those that counterfeit most successfully some other fabric.

In the early days wall paper, like all other kinds, was made in sheets instead of webs. (See PAPER.) These, of the size called *elephant* (22 × 32 inches), were pasted together to make a length of 12 yards before the pattern was applied. In those days the patterns were put in with stencils and the background with a brush. The first improvement was the introduction of block printing. In this process the pattern was engraved on wooden blocks, a separate block for each color, and each block applied to the paper by hand as many times as the pattern is repeated. The colored background was painted in with a brush.

The next advance was the application of the Fourdrinier machine, by which wall paper, instead of being made in sheets, was produced in continuous webs. Then came the cylindrical rollers, a roller for each pattern, similar to that employed for the printing of textile fabrics. (See TEXTILE PRINTING.) Later, grounding machines, for laying on the background color; bronzing machines, which apply bronze powders (popularly called gold); embossing machines, and a number of other inventions have been applied to this art. About 1870 the continuous process was introduced, by which the paper passes automatically from one step to another, without a stop and without handling. Great improvements in design and in blending of colors have also been made in recent years. An important phase of the subject is the sanitary one, serious results having followed the use of poisonous coloring materials, like arsenic.

In the United States the manufacture of wall paper was introduced by two Frenchmen, Boulet and Charden, in 1790, and only three or four more firms undertook the business before 1844. In that year the first machine for printing paper was put up in the Howell factory at Philadelphia. About the same time continuous rolls of paper came into general use, instead of sheets. From that time the business rapidly increased in importance.

The accompanying table, taken from the chapter on "Wall Papers," in *One Hundred Years of American Commerce* (New York, 1895), shows the growth of this industry:

GROWTH OF THE WALL PAPER INDUSTRY IN THE UNITED STATES

YEAR	Number of factories	Capital employed	Number of employees	Value of product
1793	1	nominal	nominal	nominal
1810	3	$30,000	75	$25,000
1844	5	150,000	500	250,000
1880	25	3,500,000	2,500	6,500,000
1890	30	9,000,000	5,500	9,000,000
1895	35	12,000,000	7,000	12,000,000

PAPER NAUTILUS, or PAPER SAILOR. The shell of the argonaut (q.v.).

PAPER WEDDING. See WEDDING ANNIVERSARIES.

PAPH'LAGO'NIA (Lat., from Gk. Παφλαγονία). In ancient geography, a district of Northern Asia Minor, bounded on the north by the Black Sea, on the east by Pontus, from which it was separated by the river Halys, on the south by Galatia, and on the west by Bithynia. The inhabitants were akin to the Phrygians and Thracians, and seem to have preserved a large degree of independence, though recognizing the suzerainty of Lydians, Persians, and Macedonians. Later the country was joined to Pontus, and after the Roman conquest was divided between the provinces of Bithynia and Galatia. It was organized into a separate province toward the end of the third century of the Christian Era. The cavalry of the country was famous, and the mountains furnished abundant timber and some metals. The chief city was the Milesian colony of Sinope, on the Black Sea.

PAPHO, or **PA'PHOS** (Lat., from Gk. Πάφος). The ancient name of two cities on the southwest coast of the island of Cyprus (Map: Turkey in Asia, E 5). The older city, sometimes called Palaipaphos (now Kuklia), was situated about a mile and a quarter from the coast. It was probably founded by the Phœnicians, and was the centre from which the worship of Aphrodite spread over the island. Remains of the wall surround-

ing the temple of the goddess still exist. In Greek legend, the goddess was said to have risen from the sea at this point, and even in the Homeric poems it is mentioned as her favorite abode. The form of the shrine of the goddess on Roman coins is strongly reminiscent of the Mycenæan period, and points also to the early date of the sanctuary, which was a place of pilgrimage until the overthrow of paganism. The other Papho, called Neopaphos (now Baffo), was on the seacoast, about seven or eight miles northwest of the older city, and was said to have been an Arcadian colony. Under the Romans it was the capital of the island and the official residence of the Governor.

PA'PIAS (Lat., from Gk. Παπίας). Bishop of Hierapolis in Phrygia. He flourished during the first half of the second Christian century, but the dates of his birth and death are unknown. He is said to have been a companion of Polycarp, and to have known personally some of the Lord's disciples, but this is uncertain. He wrote in Greek an important work, in five books, entitled *Expositions of the Oracles of the Lord*, which unfortunately has been lost. A few fragments, preserved chiefly by Irenæus and Eusebius, indicate that the work was not itself a gospel, but a sort of running commentary on the sayings (and deeds?) of Christ. They also prove that written gospels already existed. Papias diligently gathered up the primitive Christian traditions, setting a high value upon every direct line of testimony concerning the Lord's teaching.

Eusebius credits Papias with more learning than judgment, which probably means that he disliked his crude and materialistic notions of the approaching millennium, with its alleged miraculous vintages and crops. (Cf. Irenæus, *Against Heresies*, v. 33.) These conceptions, however, were not displeasing to Irenæus and other early Christians, although they were generally discarded before the fourth century. In any event, Papias's reputation does not depend upon his millenarian views. He stands as a connecting link between the Apostolic Age and that of the Apologists, a period where our sources at best are scanty, and each one correspondingly valuable.

The fragments of the *Expositions* may be consulted in Lightfoot's *Apostolic Fathers*, ed. by Harmer (London, 1893), or in Funk, *Patres Apostolici* (Tübingen, 1901). Consult, also: Zahn, *Forschungen*, part vi. (Leipzig, 1900); Lightfoot, *Essays on Supernatural Religion* (2d ed., London, 1893); Cruttwell, *Literary History of Early Christianity* (ib., 1893); Westcott, *History of the Canon of the New Testament* (7th ed., ib., 1896).

PAPIER-MACHÉ, pā'pyā'-mā'shā' (Fr., pulped paper). A tough, plastic material, made from paper-pulp, or from paper that has been reduced to a pulp, mixed with glue, paste, oil, resin, or other sizing. It has been in use for more than a century in Europe, and it is not improbable that it was first suggested by some of the beautiful productions of Sindh and other parts of India, where it is employed in making boxes, trays, etc., as well as in China and Japan. Its first application, as far as we know, was to the manufacture of snuff-boxes, by a German named Martin, in 1740. Properly speaking, papier-maché is paper-pulp molded into shape, and it has been used, not only to make small articles, such as boxes, trays, etc., but in the interior decoration of houses for cornices, ceilings, etc. From the extension of the application of papier maché to the manufacture of a number of light and useful articles, modifications have taken place in its composition, and it is now of three kinds: first, the true kind, made of paper-pulp; second, sheets of paper pasted together after the manner of pasteboard, but submitted to far greater pressure; and third, sheets of thick millboard cast from the pulp, which are also heavily pressed. The term papier-maché is in the trade held to apply rather to the articles made of the pulp than to the pulp itself; and a vast manufacture sprang up during the last century. Some articles are coated with successive layers of asphalt varnish, which is acted upon by heat in ovens until its volatile parts are dissipated, and it becomes hard and capable of receiving a high polish. Mother-of-pearl is sometimes used in its decoration, and the fine surface which can be given to asphalt varnish also permits of burnished gilding and other decorative applications with excellent effect.

PAPIL'LA (Lat., nipple). A term applied by anatomists to one of several minute, elongated, conical processes, projecting from the surface of the true skin into the epidermis, highly vascular and nervous in their character, and taking an active part in the sense of touch. Their form and structure are described in the article SKIN. The term papilla is also used to designate the optic disk or nerve-head as observed through the ophthalmoscope. See OPHTHALMOSCOPE.

PAPIL'ION'IDÆ. A family of large butterflies. See SWALLOWTAIL.

PAPIN, pā'păN', DENIS (1647–c.1714). A French physicist. He was born at Blois, where, after studying medicine, he practiced for some time as a physician. His devotion to study and research in physical science dates from his acquaintance with Huygens, and he soon after became the pupil and assistant of this famous physicist, contributing substantial improvements to the air pump. He rapidly acquired a wide reputation and visited England, where he was received with open arms by the philosophers of that country, and became a member of the Royal Society in 1680. While in England, Papin and Robert Boyle worked together and performed many experiments, Papin inventing the double air pump and the air gun during this period. To him is also due the idea of pneumatic transmission of power, but he was not able to make a practical use of his method. In 1687 Papin was called to the chair of mathematics in the University of Marburg in Hesse-Cassel, the duties of which office he discharged with zeal and success for many years. He died in extreme poverty. To Papin belongs the high honor of having first constructed a steam engine with a piston (1690), and he also used the simple method of condensing the steam to produce a vacuum beneath the raised piston. He is also the inventor of the 'safety-valve,' which was an essential part of his 'digester' (q.v.). With the latter machine Papin showed that liquids [illegible] produced atmospheric pressure would [illegible]

to boil at a much lower temperature than when freely exposed to the air. Papin discovered the principle of action of the siphon, improved the air pump of Otto von Guericke, and took part in philosophical discussions with Leibnitz. In 1690 he constructed a paddle-wheel boat in which his pumping engine was used to raise water which turned a water wheel connected with the paddle. It was destroyed by a mob on account of its interfering with the business of the boatmen. Many of Papin's numerous writings will be found in the *Philosophical Transactions*, *Acta Eruditorum*, and the *Recueil de diverses pieces* (1695). He published an explanation of the construction and uses of his 'digester' (London, 1681), afterwards (1682) translated into French, and his experiments entitled *Nouvelles expériences du Vuide* (Paris, 1674). It was not for nearly a century after his death that the great value of Papin's experiments and researches was perceived. For Papin's work connected with the steam-engine, see Thurston, *Growth of the Steam Engine* (New York, 1878). See his *Life*, by Gerland, which includes his correspondence with Leibnitz and Huygens (Berlin, 1881).

PAPINEAU, pä'pē'nō', Louis Joseph (1789-1871). A Canadian orator and political agitator. He was born at Montreal, and received his education at the Seminary of Quebec, and then entered upon the study of law. In 1809 he was elected to represent the constituency of Kent in the Legislative Assembly of Lower Canada, and in 1811 was chosen to sit for one of the districts of Montreal. During the War of 1812 he was the commander of a company of militia, but saw little active service. In 1817, as the leader of the French-Canadian Party, he was chosen Speaker, and continued to hold that position until 1837. He had frequent conflicts with the royal Governors, and in 1827 Lord Dalhousie refused to accept him as Speaker, but the Assembly insisted and Dalhousie resigned. In an effort to force the home Government to make the Provincial Council elective instead of appointive, the Assembly under his lead refused to grant supplies to the Governor, and in 1834 transmitted to England the famous 'Ninety-two Resolutions.' Affairs now became more and more critical, and in 1835 Papineau arranged with William Lyon Mackenzie, the leader of the Revolutionary Party in Upper Canada, for coöperation between their followers. In March, 1837, the English Government finally declared that an elective Council could not be granted, and authorized the Governor, since the Assembly still refused to vote supplies, to use the money in the treasury. A proclamation was issued warning the people against agitators, and, because of Papineau's violent harangues to the people, he was deprived of his captaincy in the militia. In October, 1837, he attended a meeting which decided upon revolution, though there has been much dispute as to whether he favored this action. Certain it is, however, that when the rebellion, the way for which he had prepared, broke out, he fled to the United States, where he remained for two years. He then went to France, but in 1847 took advantage of a general amnesty and returned to Canada. He was soon afterwards elected to a seat in the Lower House of the now united Canadian Parliament, but found that his old influence had departed. He retired from the public service in 1854, and spent the remainder of his life in seclusion at his residence of Montebello on the Ottawa River. Consult: Kingsford, *History of Canada* (Toronto, 1887-98); Christie, *History of the Late Province of Lower Canada* (Quebec, 1848-55); and Read, *The Canadian Rebellion of 1837* (Toronto, 1896).

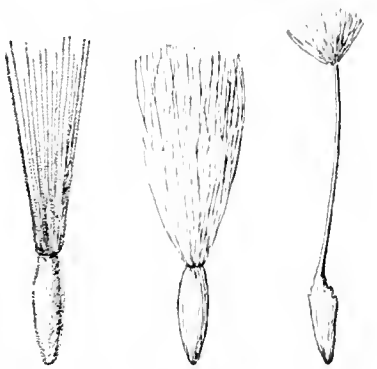
PAPINIANUS, Æmilianus. A distinguished Roman jurist, a contemporary, friend, and trusted adviser of the Emperor Septimius Severus. He was probably of Syrian-Greek origin; was born about 146 A.D.; became pretorian prefect or Chief Justice of the Empire in 203, and was put to death in 212 because (it is said) he refused to justify Caracalla's murder of Geta. He was regarded by the later Romans and is still generally regarded as the greatest of the Roman jurists. More than any other, he strove to keep law in harmony with ethics. In Valentinian's Law of Citations (426) that Emperor directed that if an equal number of authorities were produced on either side of a disputed question the opinion supported in Papinianus's writings should prevail. Both before and after Justinian's time the works of Papinianus formed an important part of the third year of legal study, and the students of that year were called Papinianistæ. His principal published works were digests of decisions: 37 books of 'questions' and 19 of 'responses.' Because he left no systematic commentaries, Justinian's codifiers drew less largely on his writings than on those of Ulpian and Paul; but excerpts from his works constitute an important part of the Digest. Outside of the Digest we have a passage from Papinianus which was included in the Breviary of Alaric (q.v.) and a few fragments of his responses found in Egypt in 1877 and 1882. These have been printed by Huschke. Consult Otto, *Papinianus* (2d ed., 1743) and the article by Bruns in Pauly, *Realencyclopädie*.

PAPIST PLOT. See Oates, Titus.

PAPPENHEIM, päp'pen-hīm, Gottfried Heinrich, Count (1594-1632). One of the leading Imperialist generals in the Thirty Years' War. He was born at Pappenheim, Bavaria, May 29, 1594, of an old and distinguished Swabian family. He studied at Altdorf and Tübingen and early identified himself with the Catholic cause. He served under the Poles against the Russians and Turks; was in the service of the Catholic League in 1620, and at the battle of the White Hill in the same year contributed greatly to the victory over the Bohemian forces. He was in 1623 made commander of the mounted regiment which became famous as Pappenheim's cuirassiers. He was a cavalry commander in the Spanish service in Lombardy in 1625-26, but rejoined the Imperialist army in the following year, suppressed a revolt of the Protestant peasants of Upper Austria, and then was engaged under Tilly in the campaigns against the Danes, Swedes, and Saxons. He took a prominent part in the storming of Magdeburg (1631), was engaged at Breitenfeld (1632) and covered the retreat of the defeated army. He served under Wallenstein in the final campaign against Gustavus Adolphus. Just before the fateful battle of Lützen he had been detached with eight regiments for an independent movement, but a recall was sent after him when the rapid ad-

vance of the Protestant leader became known to Wallenstein. His splendid charge on the left wing of the Swedish army had almost changed the result when he was mortally wounded in the last charge. He died a few hours afterwards at Leipzig, November 17, 1632. Consult Hess, *Gottfried Heinrich, Graf zu Pappenheim* (Leipzig, 1855).

PAP'PUS (Neo-Lat., from Gk. πάππος, down, from πάππος, *pappos*, grandfather, from πάππας, *pappus*, father, papa). The peculiar calyx of the Compositæ. The flowers are placed close together in the flower-head. As a consequence, the sepals are not necessary for protection, and for mechanical reasons are probably prevented from developing in a normal way. Moreover, the flowers are epigynous, so that the sepals are developed from the top of the seed-like fruit (achene, q.v.). In many cases the sepals



ACHENES.

a, Arnica; *b*, Sonchus, or sow thistle; *c*, Taraxicum, or dandelion.

(pappus) are entirely obsolete, in others they form a shallow cup or crown, in others they are arranged as teeth or scales, while in still others they constitute a tuft of bristles (*a*) or hairs (*b*). It is this last form of pappus which, as in the dandelions, thistles, etc., is a conspicuous character of the family. The hair-like pappus is exceedingly diverse in details of structure, in some cases being coarse and bristly, others soft and silky, and others beautifully plumose. In the dandelion (*c*) the achene develops a long beak at the summit of which the tuft of soft pappus hairs occurs. In case the pappus has any special development it is associated with the dispersal of the seeds. For example, the hairy pappus of thistles and dandelions enables the fruit to be carried by currents of air; while the toothed and even barbed pappus of Spanish needles serves as a grappling appendage by which the fruit may lay hold of animals brushing past.

PAPPUS, or **PAPPOS** (Lat., from Gk. Πάππος) (c.300 A.D.). An Alexandrian mathematician. He is said to have written on geography and astrology, to have composed a commentary on the *Almagest* of Ptolemy, and to have been the head of a school. His principal work, however, was a mathematical *Synagoge* (collection) in eight books, the first and half of the second of which are lost. To this work we owe much of our knowledge of Greek mathematics, and its translation by Commandin (1588) had a powerful influence on the Renaissance of geometry in the seventeenth century. In particular, the geometry of Descartes had for one of its principal objects the solution of a problem of Pappus, viz.: given 2*n* straight lines, to find the locus of points such that the product of the distances of each of these to *n* of the lines (or more generally of straight lines at given angles to the *n* lines) shall have a given ratio to the product of the distances (or lines at given angles) to the other *n*. Pappus was the last of the great Greek mathematicians, but the value of his work is largely due to the fact that it gives to us numerous extracts from the lost writings of his predecessors. The most important theorem due to him is the one often called by Guldin's name, viz.: the volume of a solid of revolution is equal to the product of the area of the revolving plane figure and the length of the path of its centre of gravity. Numerous minor propositions bear his name, such as the Pythagorean theorem as generalized for an oblique-angled triangle, in which the squares on the sides are replaced by parallelograms. The text of Pappus has been edited by Hultsch (3 vols., Berlin, 1876-78, Greek and Latin).

PAP'UA. An island north of Australia. See NEW GUINEA.

PAP'UAN or **AUSTRO-MALAYAN SUBREGION.** In zoögeography, a northern subdivision of the Australian Region, formed of the islands eastward of 'Wallace's Line' to San Cristoval, embracing Celebes, Lombok, the Giloolo group, Ceram, New Guinea, and the Solomons. All are mountainous, well forested, hot and damp, excepting the small arid group from Lombok to Timor. Considering the proximity and physical resemblance of these islands to those west of them, and their dissimilarity to the continent of Australia, it is surprising to find that their affinities are Australian rather than Oriental. The mammals are almost wholly marsupials, with one monotreme (*see* ECHIDNA) in New Guinea. A long list of peculiar genera of birds may be made, and this subregion is the special home of the birds of paradise, honeysuckers, some peculiar fly-catchers, and a host of most brilliant parrots, kingfishers, and pigeons. The extraordinary tendency toward ornamentation which characterizes the birds of these islands extends also to the insects, and has been the object of much speculation. Consult: Wallace, *Geographical Distribution of Animals*, vol. i. (New York, 1876); id., *Malay Archipelago* (ib., 1869); Forbes, *A Naturalist's Wanderings in the Eastern Archipelago* (ib., 1885).

PAP'ULE (Lat. *papula*, pimple, pustule). A medical term meaning a pimple; a small elevation of the surface of the skin containing no fluid. Papules are either of the normal skin color or red. If they become filled with fluid they are called vesicles. If pus develops in a vesicle it is called a pustule. Papules appear in the early stage of many skin diseases and form the eruption in certain other diseases, as scarlet fever, chickenpox, and smallpox. Papular skin diseases include lichen, prurigo, and pityriasis (*qqv.*).

PAPYR'OGRAPH. See COPYING MACHINES.

PAPY'RUS (Lat., from Gk. πάπυρος, *papyros*). A genus of plants of the natural order

Cyperaceæ. Egyptian Papyrus (*Cyperus Papyrus*) is a kind of sedge 3 to 10 feet high, with a very strong, woody, aromatic, creeping root, long, sharp-keeled leaves, and naked, leafless, triangular, soft, and cellular stems, as thick as a man's arm at the lower part, and at their upper extremity bearing a compound umbel of extremely numerous drooping spikelets with a general involucre of eight long filiform leaves. The plant is represented in the oldest Egyptian monuments as reaching the height of about 10 feet. The papyrus was used for many purposes. The more slender stalks were woven into baskets and boxes, while bundles of the thicker stalks formed the material of which light boats were constructed. The fibre was used for making cordage, sails, awnings, and matting. The pith was boiled and eaten by the poorer classes, and the root was dried and used as fuel. The most important use of the plant, however, was in the manufacture of a species of paper. For this purpose the pith was cut into strips which were placed side by side on a flat surface, and over the layer thus formed was laid a second layer of strips at right angles to the first. The whole was then pressed or rolled into a sheet, to which the natural gum of the plant gave a homogeneous character, and the sheet when dried was ready for use. It is possible that artificial paste was sometimes used to bind the fibres. When newly prepared the sheet was white or brownish white; but in the process of time those papyri which have reached the present day have become of a light or dark brown color, and exceedingly brittle. The papyrus or paper of the Egyptians had a great reputation in antiquity, and it appears on the earliest monuments in the shape of long rectangular sheets, which were rolled up and tied with a string. At a very late period the papyrus was no longer rolled, but was cut into square pages which were bound together as are the leaves of a modern book. The papyrus sheets and rolls are of very different heights. The tallest specimen is said to be 15½ inches high, but most literary manuscripts are from 8 to 12 inches, with a tendency toward the lower limit. The sheets are far narrower, however, rarely exceeding 9 inches, while widths of from 5 to 7 inches are common. The strips seem to have been sold in lengths of about 20 sheets, but there is no limit to the length of the rolls, though for literary purposes the Greeks seem rarely to have exceeded 30 feet. The ancient Egyptians made up huge rolls—one is said to be 144 feet long—for burial with the dead, though there is little likelihood that such unwieldy volumes were used by the living. The writing is regularly in columns, parallel to the length of the roll, and of varying width, in literary prose rarely exceeding three inches, though in verse they are often wider to accommodate the longer lines of the hexameter. Public documents and private papers are of course bound by no such rules. The use of papyrus paper, or at least of some similar manufacture from vegetable fibre, must have arisen at an early date in Egypt, and the oldest datable specimen can be but little later than B.C. 3600. (For a description of the Egyptian papyri and their contents, see the paragraph on *Literature and Science* under EGYPT.) The Greeks seem to have known a paper as early as the beginning of the fifth century B.C., though the oldest extant Greek papyrus is perhaps the *Persians* of Timotheus, belonging to the end of the fourth century. With the growth of the Alexandrian Library and the spread of Greek learning the use of papyrus largely increased, and the manufacture of the paper seems to have developed greatly under the patronage of the Ptolemies. It is only in comparatively recent years that the attention of scholars and explorers has been drawn toward the Greek papyri of Egypt, and that systematic search has been made for them. The great bulk of the enormous mass of papyri brought to light consists of non-literary documents, partly public, such as official correspondence, laws, petitions, and tax-receipts, and partly private, including wills, contracts, letters, and notes, school exercises, and accounts. These documents are of immense value as enabling us to reconstruct the life and language of the common people in the towns and villages of Egypt under Greek and Roman rule. Though the literary papyri are relatively few, they are often of great importance as restoring to us works formerly lost. Among the more important are the *Orations* of Hyperides, the *Mimes* of Herondas, the *Odes* of Bacchylides, the treatises of Aristotle on the Constitution of Athens, and the *Persians* of Timotheus. Of Christian writings the yield has not been large, nor of very striking value. There are a few fragments from the New Testament and the Septuagint, some scraps of apocryphal or heretical writings, and especially the interesting leaf from Oxyrhynchus containing some Logia or sayings attributed to Jesus. The first great discovery of papyri in Egypt was made near Arsinoë in the Fayum in 1877. Fifteen years later at Soenopæi Nesos, also in the Fayum, another rubbish heap was opened, most of whose contents went to Berlin. While the first mass was chiefly Byzantine, these were Roman and on the whole in fair preservation. An earlier period, extending well into the third century B.C., was revealed by the discovery by Flinders Petrie of a series of mummy cases made of old papyri pasted together. Patient labor separated these fragments and brought to light remnants of the lost *Antiope* of Euripides, as well as bits of the *Gorgias* and *Phædo* of Plato, and many non-literary fragments. All previous discoveries were surpassed by the work of Grenfell and Hunt at Oxyrhynchus in 1896-97, and to their continued labors at other points in the Fayum, and especially at Tebtunis, a large part of the increase since then is due. Outside of Egypt discoveries of papyri have been almost unknown. In 1753 a great mass of charred rolls were found in the Villa Suburbana at Herculaneum, and a few of these have been unrolled by means of a very delicate apparatus, but their contents have been a disappointment, as they have proved to be philosophical treatises of the Epicu-

EGYPTIAN PAPYRUS.

rean school, though the fragments of Philodemus have added somewhat to our knowledge of the history of ancient philosophy. For the handwriting on papyri, see EGYPTOLOGY; PALEOGRAPHY.

As a matter of scientific interest experiments in the manufacture of paper from the papyrus have been made in modern times by Landolina, Seyffarth, and others, and a small quantity is made at Syracuse in Sicily, though of course merely as a curiosity.

Other species of papyrus (*Cyperus Congobosus*, *Cyperus tefetum*) are much used in India for mats. *Cyperus alternifolius*, the umbrella plant or umbrella palm, is a common house plant. It grows to a height of one to three feet, with drooping involucral rays six to eight inches long and less than one-half inch broad.

BIBLIOGRAPHY. On the general subject, consult: Wilcken, *Die griechischen Papyrusurkunden* (Berlin, 1897); Kenyon, *Palæography of Greek Papyri* (Oxford, 1899); Dziatzko, *Untersuchungen über ausgewählte Kapitel des antiken Buchwesens* (Leipzig, 1900); on the results for Biblical study, Deissmann, *Bible Studies*, trans. by Grieve (Edinburgh, 1901). A periodical devoted to this subject is the *Archiv für Papyrusforschung und verwandte Gebiete* (Leipzig, 1900, et. seq.); and a brief review of the more important publications of each year may be found in the *Annual Archæological Reports* of the Egypt Exploration Fund (London, 1869 et seq.).

PARÁ, pä-rä'. An estuary indenting the northeastern coast of Brazil and forming the southern boundary of Marajo Island (q.v.), of which the true mouth of the Amazon is the northern boundary (Map: Brazil, II 4). The Rio Pará is 40 miles wide at its mouth and has, in general, a width of 5 to 10 miles for a distance of 200 miles inland. Formerly it was probably one of the principal mouths of the Amazon, but is now connected with that river only by a network of channels and backwaters, which, however, form the principal steamship routes to the Amazon, since the true mouth is obstructed by islands and strong currents. The Pará has become the almost independent estuary of the Tocantins (q.v.).

PARÁ. One of the largest and commercially most important States of Brazil, occupying the northeastern part of the Republic, and bounded by the Guianas on the north, the Atlantic Ocean on the northeast, the Brazilian States of Maranhão and Goyaz on the east, Matto Grosso on the south, and Amazonas on the west (Map: Brazil, G 4). Its area is 443,653 square miles, excluding the disputed portion of Guiana. The surface consists of plateaus rising from the here narrow Amazonian valley to a height of 2500 feet in the north and south. The Amazon River with its extensive estuary takes in a large portion of the State, and the adjoining low lands are inundated during the rainy season. Its two large tributaries, the Tapajos and the Xingu, and the system of the Tocantins, give the State a network of navigable waterways, and thus remove one of the greatest obstacles in the way of industrial development in South American countries—lack of transportation facilities. The climate is tempered by the trade winds, and is on the whole not unhealthful. Most of the low lands are covered with dense forests, which yield the most important product, as well as the chief source of revenue, of Pará—rubber. Agriculture is as yet undeveloped on account of the scarcity of population. Some foodstuffs have to be imported. Besides rubber, the annual export of which exceeds 22,000 tons, Pará exports yearly large quantities of cacao, cinchona, coumarin, glue, and hides. Most of the exports go to New York and Liverpool. The mineral deposits of Pará are believed to be extensive, but so far very little has been done toward their exploitation. Pará has no railways with the exception of a short line from the capital (Pará) to the coast. The population of Pará was only 328,455 in 1890. The Indians are mostly civilized. The capital is Pará.

PARÁ, or BELEM. The capital of the State of Pará, Brazil, situated on the southeast shore of the Pará estuary (q.v.), 85 miles from the ocean, and 1° 27′ south of the equator (Map: Brazil, II 4). Viewed from the harbor it presents a picturesque appearance with its numerous churches and white houses half hidden amid luxuriant tropical foliage. The streets are in general narrow and ill-paved, but some of them are wide and straight, and there are several spacious avenues lined with trees. The principal building is the cathedral, dating from 1720. There are a lyceum and other schools, a public library, a museum, a large botanical garden, and many scientific, literary, and charitable institutions. The Government buildings are plain structures. The harbor has 20 feet of water, and, being situated at the principal entrance for ships into the Amazon and in the northern part of the country, where it is comparatively near to the commercial countries of Europe, Pará has become an important trade centre. Its chief exports are rubber, cacao, and colonial wares. The rubber export exceeds that of any other port of the world, having in 1898 amounted to 31,882,883 pounds, with a value of about $68,850,000. The total value of the exports in the same year was about $72,000,000, which shows an increase of 100 per cent. during the preceding five years. The population has increased six-fold during the last half century, the inhabitants numbering 90,122 in 1896. Pará is the seat of a United States consul.

Pará was founded in 1615, but was an unimportant place until the middle of the nineteenth century. During the disastrous racial and social strifes of 1835-48 the population fell from 25,000 to 15,000, and it was still further reduced by the epidemic of yellow fever in 1850. Since that year, however, it has grown rapidly.

PARA (Pers. *pāra*, piece, portion). A coin of copper, silver, or mixed metal, though most generally of copper, in use in Turkey and Egypt; it is the fortieth part of a piastre, is divided into three aspers, and varies much in value, owing to the debased and complicated condition of the Turkish coinage. Pieces of five paras are also in use. Five para is equal to about one mill (American) in Turkey, and a little more in Egypt.

PARABLE (OF. *parable*, *parabole*, Fr. *parabole*, from Lat. *parabola*, *parabole*, from Gk. παραβολή, comparison, juxtaposition, parable, παραβολά, from παραβάλλειν, *paraballein*, to throw beside, to compare, from παρά, para, beside, beyond + βάλλειν, *ballein*, to throw). A short [illegible]

rative, founded upon any real event in nature or human experience, intended to convey a moral or religious meaning. The parable is best known from its use in the Bible. In the Old Testament it is not of very common occurrence. The five examples which admit of the least question are: (1) The prophet Nathan's parable of the poor man with the one ewe lamb, told to King David (II. Sam. xii. 1-4); (2) the story of the woman of Tekoa concerning her sons (II. Sam. xiv. 5-7); (3) the tale of the prophet regarding the escaped captive, told to King Ahab (I. Kings xx. 39-40); (4) Jehovah's rebuking song of the vineyard (Is. v. 1-6); and (5) the parable of planting and threshing (Is. xxviii. 24-28). Ancient Jewish writings outside the Bible abound in parables. Jesus of Nazareth was the great master in their use. In the New Testament the word parable occurs 48 times in the Synoptic Gospels, but nowhere else except twice in the Epistle to the Hebrews. It designates either a short narrative designed to convey spiritual truth, such as the parable of the sower (Matt. xiii. 8 sqq.), or, more rarely, a popular proverb, such as 'Physician, heal thyself' (Luke iv. 23). Hence many of the utterances of Jesus, which are commonly regarded as proverbs ('consider the lilies,' 'salt of the earth,' 'light under a bushel') might be classified as parables. The well-known parables of Jesus were taken from the natural scenes and events of common life with which He and His disciples were familiar. In the art with which He seized upon and illustrated the supreme point in a parable He never has been surpassed. He made both nature and history a parable of which the Kingdom of God is the spiritual interpretation. For definition of the parable and a study of those spoken by Jesus, consult: French, *Notes on the Parables of Our Lord* (New York, 1851); also Guthrie, *The Parables* (London, 1866); Bruce, *The Parabolic Teaching of Christ* (1892); Jülicher, *Die Gleichnisreden Jesu* (Freiburg, 1899).

PARABOLA (Neo-Lat., from Gk. παραβολή, *parabolē*, comparison, juxtaposition, parable, parabola). A conic section cut by a plane parallel to the element of the cone. When the plane coincides with its parallel element, the parabola assumes the limiting form of a straight line. The parabola may also be defined as the locus of a point whose distance from a fixed point (the focus) is equal to its distance from a fixed straight line (the directrix), i.e. its eccentricity (q.v.) is 1. From this definition its construction readily follows. Let DD' (Fig. 1) be the fixed straight line or directrix, and F the fixed point or focus. Draw a perpendicular to the directrix, passing through the focus, and this will be the axis of the curve. The point O on the axis, half way between F and DD', will evidently be a point on the curve. To find other points on the curve draw a series of lines parallel to the directrix and cutting the axis XX' in M_1, M_2, F, M_3, ... With F as a centre and ZM_1 as a radius, describe an arc cutting the perpendicular through M_1 in P_1 and Q_1; with F as a centre and ZM_2 as a radius, describe a circle cutting the perpendicular through M_2 in P_2 and Q_2; and so on. The points P_1, P_2..., Q_1, Q_2..., are then points on a parabola. PQ is called the latus rectum or parameter, and, as is evident from the construction, equals twice the distance between the focus and directrix. The curve may be described mechanically in the following manner: move a right-angled triangle with one perpendicular side coinciding with the directrix; a string equal in length to the other perpendicular side has one end fastened to the outer vertex of the triangle and the other to the focus; a pencil resting against the lower side of the triangle and holding the string taut will trace a parabola.

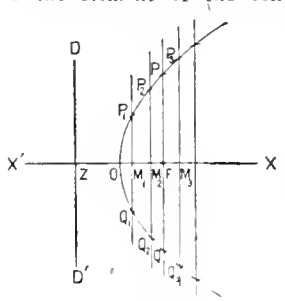


FIG. 1.

The Cartesian equation of the parabola, its axis being taken as the X-axis and its vertex as the origin, is $y^2 = 4px$, where p is the distance between the focus and the vertex. Its polar equation, the focus being the pole, is

$$r = \frac{2p}{1-\cos\theta}; \text{ or } r = \frac{4p\cos\theta}{\sin^2\theta}$$

when the vertex is taken as pole. The following are some of the most important properties of the parabola: (1) Any line RH (Fig. 2) parallel to the X-axis is a diameter, i.e. bisects a system of parallel chords, as those parallel to PQ; (2) the subnormal MN is constant and equal to the semi-latus rectum FK; (3) if the tangent through P cuts the X-axis in T, and if the normal at P cuts the X-axis in N, the focus F is equidistant from P, T, and N; (4) the angle DPT = angle XTP is equal to the angle TPF, or the tangent at any point makes equal angles with the axis of the curve and the focal radius to the point of contact (these last two properties furnish simple methods for drawing tangents to the parabola); (5) through any point in the plane, three normals can be drawn to the parabola; (6) the tangents at the extremities of any focal chord PL intersect at a point G on the directrix, and at right angles; (7) a perpendicular from the focus F upon a tangent SQ meets this tangent at a point I on the tangent through the vertex; (8) a tangent RE at the end of a diameter RH is parallel to the chords bisected by that diameter, of which PQ is one and the tangents at the extremities of PQ intersect upon the corresponding diameter SH; (9) the area of a parabolic segment ORPQ is $\frac{4}{3}$ of the triangle RPQ on the same base and

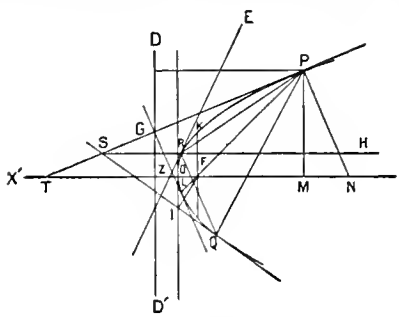


FIG. 2.

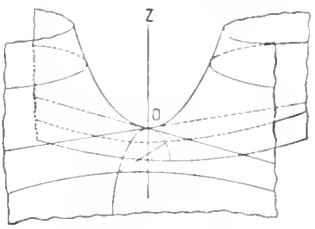
having the same height; (10) the parabola has no real finite asymptotes.

Concave reflecting mirrors are often formed so that all axial sections are equal parabolas. In such a mirror, all parallel rays of light are reflected to the focus; and, conversely, if a light be placed at the focus of such a mirror, its rays will be reflected in a parallel pencil. If a body were projected upward and obliquely to the direction of gravity, it would, if undisturbed by any other force except gravity, accurately describe a parabola whose axis is vertical and whose vertex is the highest point reached by the body. The term parabola is used in analysis, more generally, to denote that class of curves in which some power of the ordinate is proportional to a lower power of the corresponding abscissa. Thus the common parabola above given has the equation $y^2 = kx$, the cubical parabola has the equation $y = a + bx + cx^2 + dx^3$, the simplest form being $y = kx^3$ and the semi-cubical parabola, $y = kx^{\frac{3}{2}}$ or $y^2 = kx^4$. The last mentioned curve is also known as the Neilean parabola, because it was rectified by William Neil (1657).

For the various curves bearing the name parabola, consult: Brocard, *Notes de bibliographie des courbes géométriques* (Bar-le-Duc, 1897; partie complémentaire, 1899).

PAR'ABOLA'NI (Lat. nom. pl., from Gk. *παράβολος*, *parabolos*, reckless, from *παραβάλλειν*, *paraballein*, to throw beside, to compare). A class of functionaries in the early Church by some writers reckoned as members of the clergy, and included in the minor orders, but more probably religious associations, whose chief duty was to tend the sick, whether in ordinary diseases or in times of pestilence. They received their name from the boldness with which they exposed themselves to danger of contagion. By some, the association is believed to have originated at Alexandria in the time of a great pestilence under the Bishop Dionysius in the third century. They were certainly very numerous at Alexandria, amounting to some 500 or 600, but were also enrolled in other churches. We find them at Ephesus, at the time of the council in 449, and at Constantinople under Justinian. The parabolani are made the subject of formal legislation by Theodosius the Younger. At first they were subject to the Præfectus Augustalis, but a later decree placed them directly under the authority of the bishop. They seem to have been mainly from the lower classes and with a tendency to disorder. After the time of Justinian they are not mentioned.

PARABOLOID (from Gk. *παραβολή*, *parabolē*, parabola + *εἶδος*, *eidos*, form). A solid whose surface has the equation $Ax^2 + By^2 - 2Cz = 0$, or $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 2cz$. (See COÖRDINATES.) If B is positive, the surface is called an *elliptic* paraboloid; if B is negative, a *hyperbolic* paraboloid. The sections of the former made by the coördinate planes, $x = 0$, $y = 0$, are parabolas having a common axis. The section by any plane parallel to $z = 0$ on the positive side is a real ellipse; on the negative side the section is imaginary. The sections of the hyperbolic paraboloid made by the planes $x = 0$, $y = 0$ are parabolas, but the sections made by planes parallel to $z = 0$ are hyperbolas. The section made by the plane $z = 0$ is two intersecting straight lines, the limiting form of the other hyperbolas. The hyperbolic paraboloid is a special case of the hyperboloid of one sheet, and hence is a ruled surface. A paraboloid of revolution is formed by revolving a parabola about its principal axis. Its



HYPERBOLIC PARABOLOID.

equation is $x^2 + y^2 = 4pz$. Sections of such a figure perpendicular to the axis of revolution are circles. The term *paraboloidal* is applied to bodies having the general form of a paraboloid, a form commonly found in concave reflecting mirrors. See PARABOLA.

PARACATU, pä'rä-kä-tōō'. A town of the State of Minas Geraes, Brazil, near the borders of the State of Goyaz, situated 450 miles northwest of Rio de Janeiro (Map: Brazil, H 7). The town was founded near the middle of the eighteenth century, and was formerly famous for its rich gold washings. Now its chief industries are stock-raising and the cultivation of sugarcane and coffee. Its population is about 10,000.

PARACEL'SUS. The assumed name of Philippus Aureolus Paracelsus Theophrastus Bombastus von Hohenheim (1490 or 93-1541). A German physician and chemist. He was born at Einsiedeln, Switzerland, the son of a physician and chemist, Wilhelm Bombast von Hohenheim; he received his early education from his father, and at sixteen he went to Basel University, but soon abandoned it for the study of chemistry and alchemy under Withemina, Bishop of Würzburg. He traveled widely, sustaining himself by irregular practice, and collecting a vast amount of miscellaneous medical knowledge. He served some time as a military surgeon in the Low Countries, Denmark, and Italy, and learned practical metallurgy at the mines in Tyrol belonging to the Fugger family, who were celebrated for their patronage of art and science. Here he appears to have studied diligently, investigating the processes of preparing metals, and making experiments as to their medicinal virtues. His cures, real or pretended, became noised abroad, and he was called to prescribe for many of the great men of his day. Erasmus was one of his patients. At the recommendation of Œcolampadius he was, in 1526, appointed professor of physic and surgery at Basel, when he inaugurated his career as a teacher by publicly burning the works of Galen, and denouncing the Arabian masters, whose teachings were then generally followed. He also flouted tradition by lecturing in German instead of Latin. His defiance of tradition, in addition to his arrogance, vanity, and drunkenness, provoked the most bitter animosity of the regular faculty, and he was compelled to leave the university. He resumed his wanderings. Wherever he went he excited the regular faculty to a state of violent hatred, not wholly undeserved. At Salzburg he gave offense and was

thrown from a window by the servants of a physician, and had his neck broken by the fall. He was then about forty years old.

In spite of his turbulent life and charlatan methods, Paracelsus exerted a profound influence upon the medical beliefs of his time and of succeeding centuries. He struck at the weak points of the prevailing system of medicine; he destroyed the 'humoral pathology' (which was founded on the belief that diseases depended upon an excess or deficiency of bile, phlegm, or blood), and taught that diseases were actual entities, and were to be combated with specific remedies. He improved pharmacy and therapeutics, made some new chemical compounds, and strove to reduce the overdosing then practiced. A large number of medical works are attributed to him, many of which were written by his followers, and some, it is declared, by his enemies, in order to injure his reputation. Marx admits only ten as genuine, and Häser twenty-four. The earliest printed work was *Practica D. Theophrasti Paracelsus* (Augsburg, 1529). Collected editions of his writings appeared in German at Basel in 1589-91, in 1603-05, and in 1618. Latin editions in 1603-05 and 1658 (Geneva). For his life consult: M. B. Lessing (Berlin, 1839); Mook (Würzburg, 1876); Hartmann (London, 1886); Kahlbaum (Basel, 1894); and Netzhammer (Einsiedeln, 1901). Consult also Hartmann, *Grundriss der Lehren des Theophrastus Paracelsus von Hohenheim* (Leipzig, 1898), and *The Hermetics and Alchemical Writings of Paracelsus* (London, 1894).

PARACHUTE, pär'ä-shōōt' (Fr. *parachute*, from ML. *parare*, to guard against, prevent, Lat. *parare*, to prepare + Fr. *chute*, fall, OF. *cheute*, *cheoite*, It. *caduta*, fall, from Lat. *cadere*, to fall). A device for the purpose of diminishing the velocity of a falling body and used by aëronauts as a means of descending from balloons. The parachute generally takes the form of a large umbrella. Its invention is accredited to Sebastian Lenormand, and the device was used by him in 1784 in making a descent from an upper window of a house in Lyons. The first descent from a balloon was made by Garnerin in Paris in 1797, in which a parachute 23 feet in diameter, composed of a number of gores of canvas, was employed. In this parachute a wicker basket was suspended from a hoop 8 feet in diameter somewhat below the top of the umbrella-shaped surface. In its usual form, the parachute is made of canvas, being attached to the balloon so as to hang loose during the ascent, and to spread out and offer a resisting surface as soon as it is separated from the balloon and begins to fall. For a weight of 220 pounds, which includes that of the passenger as well as of the apparatus, it is necessary to have a surface about 40 feet in diameter in order to reduce the velocity to a rate of about 31½ feet per second. Under the pressure of the air such a surface would become concave and would measure about 35 feet across. The car or basket is supported by cords attached to the edge of the canvas, and sometimes there is a heavier cord or girth which passes over the top of the parachute and carries the larger part of the weight. There is generally a small opening at the top to allow some of the air to pass out, and this serves to keep the parachute steady in its proper position and prevent swinging. The concave surface has also been divided into compartments with transverse partitions for this same purpose, and each compartment has a small opening to permit of the escape of the air.

PARADE (Fr. *parade*, show, halt on horseback, from Sp., Port. *parada*, halt, parade, from *parar*, to halt, prepare, from Lat. *parare*, to prepare; connected with ἔπορον, *eporon*, I prepared). In its original sense, a prepared ground, but applied also to the courtyard of a castle or fortification, and afterwards to any inclosed and level stretch of ground. In every barracks, fort, or army post there is a parade ground upon which the regiment assembles and is formed for inspection or ceremony. Regimental parade is conducted as follows: The regiment may be formed in line, in line of platoon columns at close interval, or in line of masses. On the sounding of the assembly, companies are formed and inspected. At *adjutant's call*, battalions are formed in line; battalion adjutants, taking post in front of the centre of their respective battalions, receive the reports of the first sergeants, and present the battalions to the battalion commanders. When this is accomplished, *adjutant's call* is again sounded; the regiment is formed in line, with open ranks, each battalion at the *parade rest*. The adjutant then commands *Sound off*, and takes post six paces to the right of the colonel. The band, playing in quick time, passes in front of the adjutant and field officers, to the left of the regiment, and back to its post on the right, when it ceases. The adjutant then rides out in front of the regiment, and, bringing the regiment to *attention*, gives the commands: (1) Carry arms; (2) Present arms; after which he turns about, and reports to the colonel: "Sir, the parade is formed"; the colonel acknowledges the salute, and directs him back to his post; the staff officers and the colonel draw swords; and the latter proceeds to give such orders in the manual exercises as he may desire. After the command *order arms*, the adjutant is ordered to receive the reports, swords are returned, battalion adjutants are marched out six paces in front of company officers; commencing on the right, each adjutant salutes and reports the strength of his battalion; they are then ordered to return to their post, and the regimental adjutant reports to the colonel. After the report is acknowledged, the colonel gives the command *Publish the orders, sir*, on which the adjutant faces the regiment, and reads the orders of the day. The officers then form before the colonel, who gives whatever directions are necessary, and the ceremony is concluded. The band plays, and the various component parts are marched off to their quarters for dismissal.

Parade is also used as a term in fencing, particularly by those of the French school. It is a guard position, designed to meet or parry thrusts, the English equivalent for which is *parry*.

PARADISE (OF., Fr. *paradis*, from Lat. *paradisus*, from Gk. παράδεισος, *paradeisos*, park, Paradise, from Av. *pairidaēza*, inclosure). A word found in the Old Testament and in Greek writers from Xenophon on, as a term for the great hunting and pleasure parks of the Persian kings. It is the word translated 'forest' in Nehemiah ii. 8, and that rendered by 'orchard' in the Song of Songs iv. 13 and Ecclesiastes ii. 5;

this original sense of 'park' appears in English literature. The word was adopted by the Greek translators of the Old Testament for the 'garden' in Eden (Gen. ii. 8, and in other biblical references to Eden, q.v.). The later religious notion is bound up with the Jewish mystical thought concerning the Garden of Eden. This was supposed to be still in existence in some remote and mysteriously inaccessible place (Gen. iii. 24), to which the apocalyptic thought of Judaism, from the second century B.C., added the notion that it was reserved as the future abode of the righteous. This thought is first fully developed by the Book of Enoch (q.v.), which locates Paradise variously, in the west (like the classic Isles of the Blest), in the north (with the Mount of God), or in the east (with Genesis). According to this first stage of thought Paradise is a place of sensual delight. It was also the abode of the two saints who had been translated from this world, Enoch and Elijah. But the rapid development of eschatology grew impatient of waiting for the Day of Judgment for the decision of the fate of the dead, and in the first century B.C. Paradise became the intermediate abode of all the righteous. Yet a further step took place in the spiritualization of the idea. Just as Jerusalem was supposed to be mystically preserved in the heavens until the day of redemption (cf. Rev. xxi.-xxii.), so was Paradise caught up into the celestial spheres, and thither the spirits of the faithful were conveyed upon death. This view appears at length in the Book of the Secrets of Enoch (or Slavonic Enoch, q.v.), which locates Paradise in the third of the seven heavens, and is represented in the New Testament by Luke xxiii. 43 (cf. xvi. 23 sqq.) and II. Cor. xii. 2. At the same time there was uncertainty whether this was the final abode of the saints. Jewish theology requiring the Day of Judgment. In Revelations ii. 7 Paradise seems to be synonymous with heaven. Even in these spiritualized conceptions the imagery of the ancient Garden of Eden appears still in the Tree of Life and the Water of Life. The New Testament does not add to the idea of Paradise, but the Christian doctrine of the return of Christ to consummate His kingdom developed the notion of Paradise as the place of departed saints, where they are supposed to 'sleep in Jesus,' and at the same time to enjoy mystic fellowship with Him and with the saints on earth. In mediæval theology these distinctions are exactly drawn, whereas in most Protestant theology the doctrine of Paradise remains indistinct, and in popular Protestantism Paradise is equivalent to heaven. In Islam the crass Jewish notion of Paradise was taken over and still further sensualized: it remains a garden full of all carnal delights. (See MOHAMMEDANISM.) It is interesting to note that this idea of a garden has always appealed to the Semitic mind, which, accustomed to the desert, takes the well-watered garden as the type of heaven; but Occidental thought has stripped the theological idea of this picturesque connotation. Consult: Gunkel, *Schöpfung und Chaos* (Göttingen, 1895); Charles, *Eschatology, Hebrew, Jewish, and Christian* (London, 1899); Hagenbach, *History of Christian Doctrines* (Eng. trans., Edinburgh, 1880); Salmond, *The Christian Doctrine of Immortality* (ib., 1897). See ESCHATOLOGY; HEAVEN.

PARADISE LOST. An epic poem by John Milton, published in 1667. The idea of a great epic had filled Milton's mind for many years; at first the legend of King Arthur attracted him, but he chose at last the story of the fall of man, attempted in English by Cædmon and Fletcher. Milton may have been influenced by Andreini's drama *Adamo*, about 1640, and Joost van Vondel's drama *Lucifer*, 1654. The poem is a stately creation of life and action beyond mortal scope.

PARADISE OF FOOLS, THE. One of the four divisions of Limbo, the *Limbus Fatuorum*, reserved for fools, idiots, and lunatics; but at present the term denotes the state of mind of one who indulges in vain hopes and expectations.

PARADISE REGAINED. A poem by John Milton (1671). It supplements the *Paradise Lost*, but is written in a colder, more severe style. It is in fact a paraphrase of the narrative of the Temptation in the Gospels, a dramatic dialogue between two voices, good and evil.

PARADISO, pä'rä-dē'zō. In. (It., The Paradise). The last part of Dante's *Divina Comedia*.

PARADOXIDES, par'a-dok'si-dēz (Neo Lat. nom. pl., from Gk. παράδοξος, *paradoxos*, incredible, from παρά, *para*, beside, beyond + δόξα, *doxa*, opinion, belief, from δοκεῖν, *dokein*, to seem). An important and characteristic fossil trilobite of the Middle Cambrian rocks of North America, Europe, and Australia. The animal has a flat, long, tapering shield with large arcuate head shield and sixteen to twenty thoracic segments, and a small round tail shield or pygidium. The eyes are narrow, of crescentic outline, and not prominent, and the posterior lateral angles of the head are usually furnished with long spines. The best known species, *Paradoxides harlani*, found in the sandy shales of the Cambrian in eastern Massachusetts, sometimes attains a length of 20 inches, with a width across the head of over 10 inches. Finely preserved specimens of other species of Paradoxides are found in the limestone nodules of the Cambrian shales of New Brunswick, Canada, and Newfoundland. See TRILOBITA.

PARADOX'URE. See PALM CIVET.

PARÆSTHE'SIA. See FORMICATION.

PARAFFIN (Fr. *paraffine*, from Lat. *parum*, little + *affinis*, akin, from *ad*, to + *finis*, end). A hard, white, wax like substance largely used for the manufacture of candles, a small amount of stearin being added to render the candles translucent. Paraffin is used, besides, in making matches, in preserving meat and wood, to improve the quality of timber employed as fuel, to render fabrics waterproof, etc. It occurs naturally in the mineral ozokerite, which was formerly the chief source of the substance. The manufacture of paraffin has developed into an important industry since 1851, when it was founded by James Young, a Scotch chemist. At present, considerable quantities of paraffin are made in Germany, by distilling certain varieties of brown coal. In Scotland, the chief seat of the industry, it is made from boghead coal and certain bituminous shales. When the shale is subjected to a process of destructive distillation, a green, oily liquid passes over, which contains a large amount of paraffin in solution. This crude oil is washed with sulphuric acid and with caustic soda, and is divided into more and less vola-

tile fractions by further distillation. Most of the paraffin is contained in the heavy, non-volatile fractions; and when the latter are let stand for some time, at a sufficiently low temperature, the paraffin separates out in the form of a crystalline mass. The crude product is purified by washing with benzine and decolorized by heating with waste coal. Chemically, paraffin is a mixture of the higher aliphatic hydrocarbons (see HYDROCARBONS); the relative composition of the mixture is not always the same, and the melting temperature varies with the product, being anywhere between 45° and 90° C. Paraffin has neither taste nor odor; it is insoluble in and lighter than water.

Among the useful by-products obtained in the manufacture of paraffin are: Benzine (not benzene), asphalt, and *paraffin oil*. Paraffin oil yields oil-gas, which has a very high illuminating power and is used to enrich ordinary coal-gas; it is largely used also for lighting ships, railroad cars, etc.

PARAFFINS. See HYDROCARBONS.

PAR'AGLOB'ULIN. See GLOBULINS.

PARAGUA, pä-rä'gwä. The old Spanish name of the island of Palawan, Philippines, and the present name of the province forming the northern half of the island (Map: Philippine Islands, D 9). See PALAWAN.

PARAGUARÍ, pä'rä-gwä-rē'. A town of the department of the same name, Paraguay, 30 miles southeast of Asunción, on the railway leading from that place to Encarnación. It is the centre of traffic for the surrounding region, which is chiefly engaged in tobacco culture. Paraguarí was founded in 1775. Its population has doubled since the introduction of the railroad, and now amounts to about 7000.

PARAGUAY, păr'ä-gwā *or* pä'rä-gwī'. An inland republic of South America, bounded on the north by Bolivia and Brazil, on the west and south by Argentina, and on the east by Argentina and Brazil. It is bisected by the Tropic of Capricorn. It has an area of 98,000 square miles, being about as large as Italy excluding Sicily. The Paraná River forms a large part of the eastern boundary. The country is divided by the Paraguay River into two sections: (1) Eastern Paraguay (Paraguay proper), between the Paraguay and Paraná rivers, which has attained considerable development; (2) west of the Paraguay, that part of the Gran Chaco belonging to the Republic. Few enterprises of the white race have yet been carried into the latter region.

TOPOGRAPHY. Eastern Paraguay is a plateau of no great elevation surmounted by low ridges and hills and subsiding in the west and southwest to grassy tracts, morasses, and lagoons, which scarcely rise above the fluvial level. The plateau has an average altitude of less than 300 feet above sea level, and the hills and ridges rarely exceed 1600 feet in height. The name of mountains can hardly be assigned to these hills. Slightly undulating plains skirt the east bank of the Paraguay, but away from the river the hills soon become numerous and higher. Chains of low heights extend north and south through the country, and are hyperbolically called Sierras and Cordilleras, though hunters and maté-gatherers easily pass from one slope to the other. The fact that much of the interior is still little known is due not to these low ridges, but to the dense tangle of vegetation covering their slopes. The Gran Chaco west of the Paraguay River is mainly an immense level plain with a very slight slope toward the river, and with large areas subject to frequent inundations.

HYDROGRAPHY. Between the low ranges flow innumerable rivulets and streams. The whole country is divided into two fluvial basins, the Paraná system to the east and the Paraguay system to the west. While the Paraná is one of the largest rivers of the world and the Paraguay is its tributary, the Paraná is of minor importance in the country's development. The Paraguay River, on the other hand, has a far greater importance in the industrial advancement of the Republic. Life, energy, and progress are chiefly centred in its valley and especially on its eastern shore. Of great depth, unvarying in current and velocity, and containing an immense volume of water, it can at all times be navigated by the largest vessels, so that it forms a highway of trade into the heart of the continent. The Pilcomayo is the chief affluent of the Paraguay, but though it is navigable on the Bolivian frontier as well as in its lower reaches, the current is too feeble in its middle course across the level plain to excavate a deep channel, and the middle river is therefore too shallow for navigation.

CLIMATE. The country is hot, but the heat is tempered by many refreshing breezes from the south. The temperature of the summer months (December, January, and February) ranges from about 55° F. to 100°. From May to August (winter) it occasionally falls to about 40°, but during the day is frequently 86°. Nine of the twelve months may be said to be perpetual spring, the other three months being very hot. The annual rainfall amounts to 46 inches, distributed over about one-fourth of the days of the year. The rainy season is chiefly confined to the period between August and October, and, as the amount of precipitation shows, it cannot be compared with what is usually called the rainy season in tropical countries. The climate is not unhealthful, and white immigrants, by observing ordinary hygienic rules, maintain a high degree of vigor.

FLORA. The Paraguay River divides the country into well-defined botanical regions. In Eastern Paraguay the prevailing feature of hill and valley is virgin forests with majestic trees, tangled lianas, and brilliant flowers; among the forests are interspersed wide tracts of pasturage covered with tall grass, and pindo and mbocaya palms crowning many hills. There are also groves of orange trees whose fruitage never fails, clumps of bananas, and the large bush of the timbo, a leguminous plant. The Chaco, west of the river, on the other hand, presents the bare aspect of a heath occasionally marshy or dotted over with yatais palms; on rising ground thrive dense quebracho forests. The excellence of Paraguayan timber, both for building and cabinet-making, is far-famed. The density of many of these woods is so great that they will not float; but lighter woods, such as are needed for ordinary carpenter work, are not lacking. The forests also supply dyestuffs and many medicinal plants. Perhaps the most characteristic vegetable product is maté, which grows in the forests, is cultivated on plantations, and is the leading article of export.

FAUNA. Among the wild animals are the jaguar, the most formidable of the carnivora, the American lion or puma (which, however, is far more common in Argentina), the tiger cat, the marten, polecat, tapir, peccary, and deer. Saurians swarm throughout the country. The alligator of the Paraná is strong and large, but not so fierce as that of the Amazon. Though the venomous snakes include the rattlesnake, viper, and cobra, few cases of snake-bite occur, largely because of the great caution of the Paraguayans. The boas are enormous, but singularly inoffensive. Paraguay can boast of some of the most beautiful birds in the world. No family is unrepresented, from the enormous wading birds to the tiniest of humming-birds. In the wilderness flies, gnats, and other pests are very annoying, but, strange to say, they give little trouble in the cultivated districts.

GEOLOGY. Broadly speaking, limestones predominate in Northern Paraguay as far south as latitude 22° S., while sandstones prevail in most of the hilly regions of the south, the plains being formed of argillaceous beds and sandy stones belonging to the Tertiary epoch. In some districts volcano cones are seen. The hills and ridges are due to great dislocation of the rocks occurring long before the mighty upheaval of the Andean Cordilleras; but the present elevations are only the ruins of former lofty summits which have been degraded by long denudation. Little use is yet made of the mineral resources, though iron ore is widely distributed, marble is abundant in the north, and copper and other valuable minerals are found.

AGRICULTURE. The soil in Paraguay is generally good. Farming is the chief pursuit, but is in a very backward condition. Only about 300,000 acres are under cultivation, chiefly along the rivers, where transportation is easy. Owing to the fact that the State owns the public lands and for a long period sold large areas to capitalists and syndicates, the price of the lands most favorably situated for farming or stock-raising was high, and this helped to retard the development of agriculture. Large tracts of country also have been assigned to the holders of Paraguayan bonds as security for the national debt, and many a peasant pays rent to foreign owners of land. The most important crop is maté, whose withered leaves are used as tea, the beverage being very popular in Paraguay, Brazil, Argentina, and some other South American countries. The decoction appears to act both as a stimulant and also, by retarding digestion, as a substitute for food. Half of the crop is consumed at home. The crop is gathered from the wild shrub in the forests or from the cultivated plant, and though the adjacent districts of Brazil also produce it, that of Paraguay is superior in quality. The native orange trees yield an enormous crop. Almost every house has its orange grove. Hogs are fattened on oranges, and immense quantities are exported. Maize, the great cereal crop, is the staple food. Wheat, rice, and other cereals are raised, but not in sufficient quantities to supply the home demand. Tobacco is a large crop, and is consumed in enormous quantities, but has been so poorly cured that it is only just beginning to be important in exports. Among other vegetable products are sugar-cane, coffee, cotton, and ramie. Stock-breeding has not yet attained its proper development. The grasses are of superior quality. The number of cattle is now rapidly increasing. Good grazing lands are abundant in Eastern Paraguay, and branches are being opened by cattle men on the plains of the Gran Chaco. In 1900 it was estimated that the cattle numbered 2,743,665; horses, 182,790; mules and asses, 7626; sheep, 214,060; goats, 32,334; and hogs, 23,900. The cattle are used chiefly for meat (including jerked beef), and for hides, which are a large export. As in all Spanish countries, butter is scarcely known, but butter and cheese are now produced by foreign immigrants for their own consumption. Among the numerous forest products the *quebracho colorado*, now found only on the Chaco, is most important. It contains nearly 30 per cent. of tannin and is used chiefly for tanning, but also for railroad ties and other purposes. Large quantities of the wood are exported to Germany, and the tannin is also locally extracted. The export of forest products for Europe and other parts of the world is increasing, though the difficulty of carrying them to the Paraguay and Paraná rivers for shipment is still great. Paraguayan woods for piles in the harbor works of Argentina and Uruguay and for railroad ties are in large demand.

MANUFACTURES. The country has made little advance in general industries. In 1899 308 distilleries were making spirits from sugar-cane juice, 3 sugar factories were producing an inferior grade of sugar for home consumption, and 73 kilns were turning out brick and other clay products. Other manufacturing industries are tanning, and furniture and cigar making. There were in 1899 35 wood yards, 36 bakeries, 26 blacksmith shops, soap works, etc. Many of the Indians, under the tuition of the Jesuits, have become skilled in various trades.

COMMERCE. The following table shows the value of the imports and exports in gold dollars at Asuncion, the capital and chief town:

	1898	1899	1900	1901
Imports	$2,608,487	$2,147,858	$1,858,710	$3,003,658
Exports	2,463,294	2,021,023	2,064,290	2,529,307

As all the people dress in cotton fabrics, these textiles are the principal foreign purchases, being followed by wine and rice. About half the imports come from Great Britain and 85 per cent. of the foreign purchases are textiles. The chief exports in 1901 (gold value) were: maté, $774,090; hides, $755,348; tobacco, $193,845; timber, oranges, and hair. Other exports include leather, manioc, and ostrich feathers.

TRANSPORTATION AND COMMUNICATIONS. Four fairly good roads lead from Asuncion to various parts of the country. With these exceptions there are scarcely any roads, and land transportation is difficult and costly. A number of the tributaries of the Paraná and Paraguay are important in the transportation of forest products to those rivers, but the stage of water in them is often too low for navigation. Thus it is very difficult at times to deliver a part of the maté crop at the large rivers for shipment. In 1896 the Great Southern Railroad of Argentina purchased ties in Australia because Paraguay, with its enormous quantities of timber adapted for that purpose, could not ship the supply needed in the stipulated time. The traffic of the country

is centred on its two great rivers, the Paraguay carrying the larger part of it. In 1901 2157 steamers and sailing vessels entered and cleared at the port of Asuncion. Some of the largest and finest river steamers in the world ply between that port and Buenos Ayres. A railroad is in operation between Asuncion and Pirapo, 156 miles.

GOVERNMENT. The present Constitution was adopted by a popularly elected convention of 60 delegates which met at Asuncion on August 15, 1870. The government is that of a centralized republic. The legislative power is vested in a Congress consisting of a Senate and a Chamber of Deputies. Both Senators and Deputies are elected by universal suffrage in the proportion of one Senator for each 12,000 inhabitants, and one Deputy for each 6000. The Senators are chosen for a term of six years, one-third retiring every second year. The Deputies serve for four years, one-half of the membership of the chamber retiring biennially. The executive power is vested in a President chosen for a term of four years by an electoral college very similar to the method followed in the United States. He is eligible to reëlection only after an interval of eight consecutive years. He is aided in the exercise of his functions by a Cabinet of five ministers who are responsible to the Legislature. In case of death or inability of the President he is succeeded by a Vice-President, who is *ex-officio* President of the Senate. The judicial power is vested in a Supreme Court consisting of two associate justices and one chief justice; five inferior courts; and a series of magistrates' courts, of which there is one in each town of importance. The Supreme Court is a tribunal of last resort and possesses the right to pass upon the constitutionality of acts of Congress. The justices are appointed by the President with the consent of the Senate for a term of four years. The powers of the executive and of Congress, the guarantees in behalf of civil liberty, the provision for amending the Constitution, etc., are quite similar to those in the Constitution of the United States. For purposes of local government Paraguay is divided into 83 circumscriptions called 'departments,' which are in turn subdivided into cantons. The capital is Asuncion (q.v.).

FINANCE. The revenue is almost wholly obtained from customs dues. Stamp duties, patents, harbor duties, postal charges, and the like are so moderate that they are no appreciable burden upon the people. The revenues and expenditures are small when compared with those of most other countries. The figures for four years are as follows, the value being expressed in paper dollars, which are worth only about one-tenth of the gold dollar:

	1896-97	1897-98	1899-1900	1900-01
Revenue	$4,200,009	$8,977,209	$9,866,000	$11,412,747
Expenditure	6,852,384	8,441,275	8,122,139	.....

Paraguay incurred a large foreign debt chiefly on account of prolonged civil wars. As a result of the country's failure at times to meet its obligations, it has been necessary to make arrangements for scaling the debt and reducing the interest. The debt in 1874 amounted to $7,527,000 (gold), but it was agreed in 1885 that in exchange for this debt new bonds to the amount of $4,250,000 should be issued. An arrangement was also made for the future payment of interest, and land was assigned to creditors in payment of arrears of interest up to July, 1886. The holders of these unpaid interest coupons received land warrants, and the Paraguay Land Company, later known as the Anglo-Paraguayan Land Company, was formed to deal with these warrants. Another arrangement was made with the bondholders in 1895 for the reduction of interest, refunding of interest coupons in arrears, the creation of a sinking fund, and the assignment of securities. The outstanding debt in 1902 was $4,688,750 (gold), and the guarantee debt which the Government owed to the Paraguayan Central Railroad amounted to $5,130,305.

There are five banks: the Agricultural Bank, with a capital of 3,025,723 pesos (for value see below), the Territorial Bank, the Mercantile Bank, the Bank of Los Rios, and the Caja de Crédito Commercial. Paper money is chiefly in circulation, the amount on December 31, 1901, being 10,566,171 pesos.

The nominal value of the peso is $1, but as compared with the paper peso gold is at a premium of about 1000 per cent. The legal value of the gold peso is one American gold dollar. The silver peso varies in value according to the gold price of silver. The metrical system of weights and measures has nominally been obligatory since 1886, but practically the old Spanish weights and measures have remained in use.

The Paraguayan standing army has 1500 men.

POPULATION. The census of 1899 showed a population of about 630,000, of whom nearly 100,000 were Indians. The foreign population in 1895 numbered 5000 Argentines, 2500 Italians, 1500 Spaniards, 1250 Germans, 800 French, 600 Brazilians, and 1000 Swiss, Austrians, English, and other nationalities. The Paraguayans are a hospitable, well-meaning people, whose prosperity was long retarded by terrible misrule, but whose position is improving under the present favorable conditions of government.

EDUCATION AND RELIGION. The schools are supported by the State, but though education is nominally compulsory, only about one-fifth of the adult Paraguayans can read and write. In 1897 there were 390 public and private elementary schools, with 25,000 pupils and 700 teachers. A number of Protestant schools are maintained and private schools are partly supported out of the public funds. An agricultural school near Asuncion, with a model farm, is having a favorable influence upon farming. The national college, with 15 professors and 205 students, is situated at Asuncion. This city has a public library and five newspapers. The Roman Catholic is the State religion, but everyone is protected in the exercise of his own religion.

IMMIGRATION. The Government encourages immigration, yet, owing to the troubled history of the country until quite recently and the nearer opportunities presented by Argentina, the incomers from foreign countries have been comparatively few. In 1897 there were seven agricultural colonies, embracing 2148 inhabitants, Italians, Germans, French, Spaniards, Swiss, and English. They cultivated 10,000 acres and possessed 235,246 fruit trees, 62,620 coffee plants, 1444 horses, and 14,615 cattle. A con-

siderable number of foreigners, also, scattered through the towns, are leaders in business affairs and a helpful, progressive element.

History. The native inhabitants of the region above the junction of the Paraná and the Paraguay rivers belong to the warlike race of the Guaraní (q.v.). The country was first explored in 1527-28 by Sebastian Cabot, who made his way for several hundred miles up the course of these two streams. In 1529-30 Diego Garcia entered the same region, and in 1536 or 1537 Juan de Ayolas laid the foundation of a town at Asuncion. He was murdered by the natives, but Martinez Yeala, who succeeded him, soon put the colony in a prosperous condition and it promised to become one of the most important in South America. His power was largely personal, however, and after his death a period of anarchy ensued, which effectually destroyed Spanish influence over the natives. The country was considered as a dependency of the Viceroyalty of Peru, which exercised, however, little more than nominal oversight. The history of Paraguay is chiefly remarkable for the long civil and religious domination of the Jesuits, extending from 1609 to 1768. The missions, or Reductions as they were called, were not only centres of education and civilization, skillfully directed to appeal to the habits and imagination of the natives, but they were refuges from the rapacity and oppression of the Spanish conquerors, and as such acquired an influence and moral ascendency in many ways analogous to that exercised by the monasteries of Europe in the early Middle Ages. The disciplinary rule of the Jesuits was thorough. They instituted a penal code with carefully graduated penalties, and established large schools for the education of the children. The economic character of the Reductions was largely communal, in keeping with native customs and traditions. After the expulsion of the Jesuits the missions soon became deserted. At that time (1768) there were in the various Jesuit stations some 400,000 natives. In 1776 Paraguay was included in the Viceroyalty of Rio de la Plata. The Spanish Government was overthrown in 1811. The last Governor quietly resigned his office, and his place was taken by a triumvirate, one of whose members was José Gaspar Francia (q.v.), who soon made himself Dictator, upon the occasion of a war with the Argentines, and held that position until his death, in 1840. His rule was based on a policy of national isolation. He attempted to cut off all intercourse with other States, and actually closed the Paraguay River to navigation. His policy was followed by his successors—Vidal, who ruled the country from 1840 to 1844; Francia's nephew, Carlos Antonio Lopez (1844-62); and from 1862 to 1870 the latter's son, Francisco Solano Lopez (q.v.). The last named, an ambitious despot, plunged Paraguay into a five years' war with Brazil, Argentina, and Uruguay, which utterly exhausted the country. The struggle terminated with the death of Lopez at Aquidaban in 1870. The establishment of peace was followed by the adoption of a more liberal Constitution.

Bibliography. Demersay, *Histoire physique, économique et politique du Paraguay* (Paris, 1865); Du Graty, *La république de Paraguay* (ib., 1865); Clemens, *La Plata Countries of South America* (Philadelphia, 1886); Vincent, *Round and About South America* (New York, 1888); Criado, *La república de Paraguay* (Asuncion, 1888); Braine-le-Comte, *La république de Paraguay* (Bordeaux, 1889); "Paraguay," *Bureau of American Republics, Bulletin 54* (Washington, 1892); Mulhall de Bourgade, *Paraguay* (London, 1892); *Handbook to the River Plate Republics, Comprising Argentine Republic, Uruguay, and Paraguay* (Buenos Ayres, 1892); La Dardye, *Paraguay*, translated by Ravenstein (London, 1892); Van Bruyssel, *La république de Paraguay* (Brussels, 1893); Olascoaga, *Paraguay*, translated from Reclus, *Geographie universelle* (Asuncion, 1896); Decoud, *Geografia de la república del Paraguay* (2d ed., ib., 1896); Santos, *La república del Paraguay* (ib., 1897). For history, consult: Graham, *A Vanished Arcadia* (London, 1901), for the Jesuit period; Rengger, *The Reign of Francia* (ib., 1827); Robertson, *Letters on Paraguay* (ib., 1838); id., *Letters on South America* (ib., 1845); Page, *The La Plata* (New York, 1860); Hutchinson, *The Paraná* (London, 1868); Thompson, *The War in Paraguay* (ib., 1869); Burton, *Letters from the Battlefields of Paraguay* (ib., 1870); Washburn, *History of Paraguay* (Boston, 1871).

PARAGUAY RIVER. A river of South America, the largest tributary of the Paraná (q.v.). It rises on the plateau of Matto Grosso and flows in a general southward direction, at first wholly in Brazil, then on the boundary between Brazil and Bolivia, then through the centre of Paraguay, and finally, below Asuncion, on the boundary between Paraguay and Argentina until it joins the Paraná near Corrientes (Map: South America, D 5). Its total length is about 1500 miles. Its sources are a series of lakes called As Sete Lagoas, which are believed to be also the source of a headstream of the Tapajoz, which flows into the Amazon. After leaving the plateau in a series of rapids the river flows for the rest of its course with a tranquil current over an almost level bed through the great plains known as the Gran Chaco and the Pampas. The upper part of this plain, above the Bolivian frontier, forms the marshes called the Laguna de los Charayes (Xarayes). This tract is converted during the annual floods into a vast lake over 100 miles wide and several hundred miles long, leaving exposed only a few islands and the rows of trees which line the banks of the permanent streams. Below the Charayes the river is again confined to its banks by spurs of the plateau, and farther south its bed is so deeply cut into the plain that the latter generally escapes inundation. Below Asuncion, however, the banks again become marshy. From the escarpment of the plateau to the confluence with the Paraná, a distance of 900 miles, the river is entirely free from obstructions, and is navigable at all seasons for small vessels, which can also ascend the São Lourenco to Cuyabá in Brazil. Steamers drawing nine feet can at all seasons reach Corumba at the southern end of the Charayes, and the river is the only commercial outlet for Matto Grosso and Paraguay. Two lines of steamers ply regularly between Asuncion and Buenos Ayres, each running one steamer weekly, and in 1898 nearly 500 ocean vessels entered the former port. The longest tributaries of the Paraguay are the Pilcomayo and the Berbejo. The river was discovered by Sebas-

[illegible] in 1526, ascended the Paraná as [illegible]

PARAGUAY TEA. A South American [illegible] See MATÉ.

PARAHELIOTROPISM from Gk. παρά, *para*, beside — ἥλιος, *hēlios*, sun — τροπή, *tropē*, a turning, from τρέπειν, *trepein*, to turn. A sensitiveness of plants, especially of leaves, to the rays of light, by which they take the position of least illumination when exposed to intense light. Parahelioptropic leaves may turn their tips either toward or away from the source of light. In either case the response brings the plane of the leaf parallel to the direction of the incident light rays. Thus the leaf is much less strongly illuminated than in the diaheliotropic position, at right angles to this direction. Many plants of the pea family show this response on bright days in summer. See HELIOTROPISM.

PARAHYBA, or PARAHIBA, pä'rä-ē'bä. One of the smaller states of Brazil, lying in the easternmost part of the country, and bounded by the state of Rio Grande do Norte on the north, the Atlantic Ocean on the east, Pernambuco on the south, and Ceará on the west (Map: Brazil, K 5). Area, 28,850 square miles. The surface is low and marshy on the coast, but the greater part consists of an elevated plateau whose slopes are heavily forested. The climate is dry and healthful, but the soil in the interior supports only a scanty vegetation. In the coast region are raised sugar, cacao, rice, and tobacco, and some coffee is cultivated in the more elevated regions. The population in 1890 was 457,232, consisting largely of Indians and Negroes. The capital is Parahyba (q.v.).

PARAHYBA, or PARAHIBA. The capital of the State of Parahyba, Brazil, situated on the river of the same name, about 10 miles from the sea, and 50 miles north of Pernambuco (Map: Brazil, I 5). The town lies partly on hills and partly in a plain; the former section is the old city and has dwindled away, while the newer portion, along the river, forms, with its port of Cabadello, the business quarter. The most notable structures are the cathedral and a former Jesuit college, which contains the state offices. The harbor of Cabadello is deep enough for vessels of 15 feet draught, and from it sugar and cotton are exported. Population, in 1890, 15,000. Parahyba was founded by the Portuguese in 1579, being one of the oldest settlements of Brazil.

PARAL'DEHYDE from Gk. παρά, *para*, beside — Eng. *aldehyde*, clipped form of Neo-Lat. *alcohol dehydrogenatum*, alcohol deprived of hydrogen. A polymeric form of aldehyde with the symbol $(C_2H_4O)_3$, occurring as a colorless or pale yellow oily liquid, soluble in about nine parts of water and miscible with the oils, ether, and alcohol. It is obtained by treating aldehyde with dilute sulphuric acid or dilute nitric acid. In medicine, it is used as a hypnotic (q.v.) principally, rarely as a diuretic and antispasmodic. Excitement follows its administration, which is succeeded by sound and refreshing sleep, without digestive or cerebral disturbance. It does not weaken the heart's action. See ALDEHYDE.

PARALLAX (from Gk. παράλλαξις, *parallaxis*, alternation, from παραλλάσσειν, *parallassein*, to make alternate, from παρά, *para*, beside — ἀλλάσσειν, *allassein*, to alter, from ἄλλος, *allos*, other). The apparent displacement of an object caused by a change of place of the observer. When an object at M (Fig. 1) is looked at from

FIG. 1.

P, it appears in line with some other object, S; but after the observer has moved to E, M has apparently retrograded to a position in line with S'; this apparent retrogression is called *parallax*. The angle PME is called the *angle of parallax*, and is the measure of the amount of parallax. To astronomers the determination of the parallax of the heavenly bodies is of the greatest importance, for two reasons—first, from the necessity of referring all observations to the earth's centre, i.e. so modifying them as to make it appear as if they had been actually made at the earth's centre; and secondly, because parallax is our only means of determining the magnitude and distance of the heavenly bodies. The *geocentric* parallax, the apparent displacement of a heavenly body due to its being observed from a point on the surface of the earth instead of from its centre, may be determined as follows: Let P and P' be two stations on the surface of the earth (Fig. 2), E its centre, M the object to be ob-

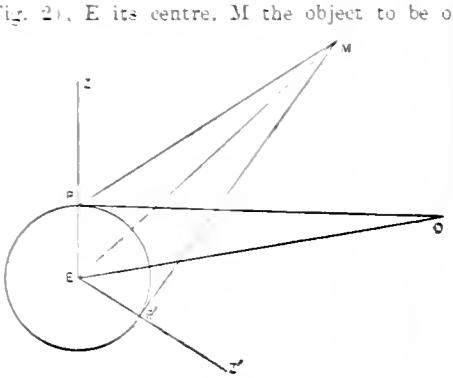


FIG. 2.

served, and Z and Z' the zeniths respectively of the observers at P and P', then at P and P' let the zenith distances, ZPM and Z'P'M, be observed simultaneously, and since the latitudes of P and P', and consequently the angle PEP', is known, from these three the angle PMP' (the sum of the parallaxes at P and P') is at once found; and then by trigonometry the separate angles or parallaxes PME and P'ME. When the parallax of M, as observed from P, is known, its distance from E, the centre of the earth, can be at once found in terms of the earth's radius as a unit. When the heavenly body is on the horizon, as at O, its geocentric parallax is a maximum, and is known as the *horizontal* parallax.

In the case of the fixed stars, which are so far away that to them the earth's radius subtends only an infinitesimal angle, it becomes necessary to make use of a much larger base-line than the earth's radius, and, as the largest we can employ is the radius of the earth's orbit, it

accordingly is made use of, and the displacement of a star, when observed from a point in the earth's orbit instead of from its centre, the sun, is called the *annual* or *heliocentric* parallax. Here the base-line, instead, as in the former case, of being 4000 miles, is about 92,800,000 miles, and the two observations necessary to determine the parallactic angle are made from two points on opposite sides of the earth's orbit, at an interval as nearly as possible of half a year. Yet, notwithstanding the enormous length of the base-line, it bears so small a proportion to the distances of the stars that only in a few cases have they been found to exhibit any parallactic motion whatever, and in no case does the angle of parallax amount to 1". See STAR.

SOLAR PARALLAX. The extremely precise determination of this quantity is very important, since the solar parallax is our only means of determining the distance of the sun from the earth. This is the fundamental unit of distances in astronomy. Upon it depend directly all our notions as to the magnitude and distance of the other members of the solar system, and of the universe in general. The solar parallax problem is not only the most important one in fundamental astronomy, but it is also, perhaps, the one offering the greatest difficulty in solution. Astronomical instruments enable us to submit to actual measurement only the directions in space of the heavenly bodies, never their distances. These latter must be obtained by computation from measured directions or angles, and for this purpose some base-line is indispensable. The largest possible terrestrial base-line is of course a diameter of the earth. Yet so small is even this compared with the distance of the sun, that it would subtend an angle of only about eighteen seconds of arc to an imaginary observer at the sun's centre. When we reflect that an angle of one second corresponds to only three-tenths of an inch at a distance of one mile, we get some idea of the extreme minuteness of the earth's diameter as seen from the sun.

It is never possible, of course, to get a complete diameter of the earth for a base-line; but extraordinary efforts have been made to come as near as possible to this ideal condition. For many years observations of transits of Venus were considered the most favorable means of measuring the small angular differences of direction of the sun's centre as seen from opposite sides of the earth. No expense was spared, especially for the transits of 1874 and 1882, to secure very complete observations. Yet, although the various civilized governments of the world sent out numerous and most elaborately equipped observing expeditions, the whole operation turned out practically a failure. It was simply impossible by this method to secure observations of the requisite precision. Of late years, two other methods have been pretty generally accepted as the best. The first is based on the so-called constant of the aberration of light. (See ABERRATION OF LIGHT.) It is known that the directions in which we see the stars are apparently thrown forward toward that part of the sky to which the orbital motion of the earth is carrying the observer. It is a phenomenon analogous to the well-known fact that if a man be running in a rain-storm the falling drops seem to slant toward him though they are really falling vertically. So their directions seem to be thrown forward in the direction of the observer's motion. In the case of the earth's orbital motion around the sun, the observer will be moving in opposite directions in space at intervals of half a year. Consequently the effect of aberration is reversed, and the so-called 'constant' or amount of aberration admits of determination from the differences of observations made six months apart. The solar parallax can be computed from the aberration constant, since we know, with quite sufficient precision, the velocity of the transmission of light in space.

The other accredited method of determining the parallax is by observations of the planetoids. The method is extremely simple in practice, and also very accurate. It is necessary merely to wait for a time when one of these little bodies is favorably situated for observation, and then to fix its position telescopically with respect to the neighboring stars. Let this be done simultaneously at two observatories situated very far apart on the earth, and using, of course, the same stars in both places. Then it is clear that the position determined for the planet will not be quite the same at the two observatories. The base-line is the straight line joining the two observatories. As a result we obtain directly the distance of the planet from the earth, in terms of this base-line as a unit. But this is known in miles from existing geodetic surveys of the earth. Thus we arrive at a knowledge, in miles, of the planetoid's distance. But from the ordinary processes of astronomical observation, we know the so-called elements of the planetoid's orbit. (See ELEMENTS.) We can find from these, by a simple computation based on Kepler's laws, the distance of the planetoid from the earth in terms of the latter's distance from the sun. Knowing then the distance between the earth and planetoid in miles from the special parallax observations, and in terms of the distance 'earth-sun' from theory, we can at once deduce the value of 'earth-sun' in miles. This, combined with our knowledge from geodesy of the terrestrial radius in miles, enables us to compute the angle subtended by that radius to an observer in the sun — in other words, the solar parallax.

The planetoid method was put in operation by no less than twenty-five observatories, acting in co-operation. By thus increasing the number of observation stations the precision of the final result could not fail to be greatly enhanced. The entire campaign was planned and managed by Gill, of the Cape of Good Hope Observatory. The observatories taking a principal part in the work, in addition to that at the Cape of Good Hope, were those at Bamberg, Leipzig, Göttingen, and, in this country, Yale University. All these observatories are provided with the modern heliometer, probably the most precise apparatus for measurement on the sky at present known to science.

The parallax determinations through the constant of aberration have been made principally in connection with the study of latitude variation.

It may be of interest here to show the relative precision or 'weight' of the various parallax methods. The general work of highest authority on this subject is the *Fundamental Constants of* [illegible] by Simon Newcomb (Washington [illegible]). Newcomb assigned the following 'weights' or relative degrees of precision:

From the aberration constant.. .... weight 68
From the planetoid method .... weight 20
Six other methods combined. .. .. weight 35

Newcomb was already at that time in possession of preliminary results of Gill's researches, communicated to him in advance of publication. But after his writing several important series of aberration determinations were made public, and the results exhibited certain small discordances among themselves, which discredited somewhat the aberration method, and consequently enhanced the relative weight of the planetoid method. The latter method gained also from the discovery in 1898 of a new planetoid, much more favorably situated for parallax determinations than any previously known. See EROS.

The final result for the solar parallax at present accepted by astronomers in general is 8″.80, corresponding to a distance of 92,789,000 miles between the earth and the sun.

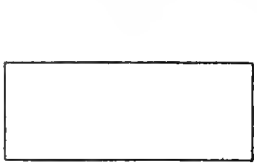
PAR'ALLEL'EPI'PED (ML. *parallelepipedum*, from Gk. παραλληλεπίπεδον, *parallēlepipedon*, from παράλληλος, *parallēlos*, parallel, from παρά, *para*, beside, beyond + ἀλλήλων, *allēlōn*, of each other, from ἄλλος, *allos*, other + ἄλλος, *allos*, other, + ἐπίπεδον, *epipedon*, plane surface, from ἐπί, *epi*, upon + πέδον, *pedon*, ground), or PARALLELOPIPED. A solid figure having six parallelograms for faces. Therefore any two opposite faces are equal and parallel. If the faces are all squares the parallelepiped is a cube. The volume of a parallelepiped is found by multiplying its base by the altitude.

PARALLEL FORCES. See MECHANICS.

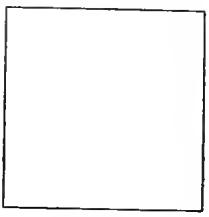
PARALLELISM. A term used in philosophy to denote an hypothetical relation of matter and consciousness. In the history of philosophy Spinoza is the most thorough-going parallelist, holding that matter and ideas are both attributes of one divine subject, and that every material object, or instance of the material attribute, has its ideal counterpart. In modern times the term parallelism is used more particularly in psychology and in epistemology to denote the specific parallelism of the human (or animal) body with the concrete consciousness of man (or lower animal). In this usage, parallelism means the concomitance of brain process and mental process. It is distinguished from interactionism, which holds that mental processes may cause and precede brain processes and *vice versa*. Psychologists, however, do not accept parallelism as an explanatory theory, but only as an hypothetical statement of a relation of body and mind which may be used as a basis for formulation of psycho-physical facts. The solution of the problem is by them held in abeyance or referred to the epistemologist. See BODY AND MIND: DUALISM: KNOWLEDGE, THEORY OF; MIND-STUFF THEORY; OCCASIONALISM.

PARALLEL MOTION. See MECHANICS.

PAR'ALLEL'OGRAM (Lat. *parallelogrammum*, from Gk. παραλληλόγραμμον, parallelogram, neu. sg. of παραλληλόγραμμος, *parallēlogrammos*, bounded by parallel lines, from παράλληλος, *parallēlos*, parallel + γράμμα, *gramma*, line, letter, from γράφειν, *graphein*, to write). A quadrilateral whose opposite sides are parallel. From this it follows that the opposite sides and angles must be equal. Therefore, if one angle of a parallelogram is a right angle, all of them are, and the figure is then called a *rectangle;* and if at the same time all the sides are equal, the figure is a *square*. If the sides are equal, but not the angles, it is a *rhombus*. If only the opposite sides are equal, it is a *rhomboid*. The diagonals of a

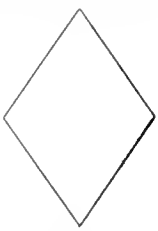


RECTANGLE.



SQUARE.

parallelogram bisect each other, and each bisects the parallelogram: the sum of their squares is equal to the sum of the squares of the sides of



RHOMBUS.

RHOMBOID.

a parallelogram. All parallelograms which have equal bases and equal altitudes are equal in area, and this is found by multiplying the base by the altitude.

PARALLELOGRAM OF FORCES. See MECHANICS, section *Two Non-Parallel Coplanar Forces.*

PARALLELS (OF. *parallele*, Fr. *parallèle*, from Lat. *parallelus*, *parallelos*, parallel). In military fortifications, trenches cut in the ground, parallel to the position under siege, and designed to protect the men and guns of the besiegers from the fire of the besieged. See SIEGE AND SIEGE WORKS: FORTIFICATION.

PARALLELS, or CIRCLES OF LATITUDE. Circles drawn round the surface of the earth parallel to the equator. They are the intersections with the earth's surface of planes which cut the earth at right angles to its axis. The greatest of these circles is the equator, which has the centre of the earth for its centre, the radius of the earth for its radius, and is equally distant at all points from each pole. It is evident that of the others, those next the equator are greater than those more remote, and that they become less and less till at the poles they vanish altogether. The radius of any one circle is equal to the earth's radius multiplied by the cosine of the latitude, if we regard the earth as a sphere. The rotary velocity of the earth's surface, which is about 17¼ miles per minute at the equator, is therefore about 8⅝ miles in latitude 60°; and in latitude 89½° (within 35 miles of the pole) is not more than 267 yards per minute. The most important parallels of latitude are the *tropics of Cancer* (latitude 23° 28′ N.) and *Capricorn* (latitude 23° 28′ S.), and the *Arctic* (latitude 66° 32′ N.) and *Antarctic circles* (latitude 66° 32′ S.).

PARALLEL SAILING. See SAILINGS.

PARALYSIS (Lat., from Gk. παραλυσις, palsy, paralysis, from παραλύειν, *paralyein*, to disable the side, from παρά, *para*, beside, beyond + λύειν, *lyein*, to loose), sometimes called PALSY. A loss, more or less complete, of the power of motion. By some writers the term is made to include loss of sensation. When the upper and lower extremities on both sides and more or less of the trunk is involved, the affection is termed general paralysis. Frequently only one-half of the body laterally is affected, the other side remaining sound. To this condition the term hemiplegia is applied. When the paralysis is confined to all the parts below an imaginary transverse line drawn through the body, or to the two lower extremities, the condition is known as paraplegia. When one part of the body, e.g. a limb or one side of the face, is exclusively affected, the condition is known as a local palsy or local paralysis. In some cases the loss of sensation and of motion in the paralyzed part is complete, while in others there is only some loss of power. In the former case the paralysis is said to be complete, in the latter partial. In most cases, but not invariably, sensation and motion are simultaneously lost or impaired. When motion is lost but sensation remains unaffected, the condition is known as akinesia. More rarely there is a loss of sensibility while the power of motion is retained. To such a condition the term anæsthesia is applied. This latter affection occurs most frequently in the organs of special sense, as, for example, in the tongue, where the sense of taste may be lost without any impairment of motion.

Paralysis is not a disease in itself, but merely a symptom of disease usually located in some part of the body other than that affected by the paralysis. Rarely are disturbances of sensation or of motion due to changes which are primarily in the skin area or muscles affected by the paralysis. This does, however, sometimes occur, as in the paralysis of progressive muscular dystrophy, where the primary lesion is in the muscles affected. The proper appreciation of external stimulation, i.e. sensation, and the proper carrying out of voluntary movements of the muscles, are dependent upon the integrity of the parts of the nervous system which govern such sensations and movements. The nerve terminations in muscle, skin, etc., serve as means for the reception and distribution of nervous impulses. The nerves themselves carry impulses between the nerve centres in the brain, spinal cord, and ganglia, and the peripheral nerve terminations. The brain, spinal cord, and ganglia serve as centres in which nervous impulses originate, are transformed, and associated. It thus follows that paralysis is a symptom which is usually indicative of pathological changes in (1) the peripheral nerves, or (2) the nerve trunks, or (3) the nerve centres in the brain, cord, or ganglia, and it is in these organs that the lesions of paralysis must usually be sought, and not in the paralyzed parts themselves. Thus disease of the peripheral nerves may cause paralysis, e.g. the paralyses occurring in peripheral neuritis. More frequently disease of or injury to nerve trunks, or tumors, or displaced bone pressing upon nerve trunks, causes paralysis in the parts supplied by the nerve or nerves affected. The completeness of the paralysis is determined by the extent of the injury to the nerve fibres and by the completeness of the interruption of nerve impulses. The spinal cord (see NERVOUS SYSTEM AND BRAIN) acts by means of its gray matter as a centre for automatic, reflex, and trophic impulses, also through its fibre tracts (white matter) as a pathway by means of which impulses are transmitted to and from the higher centres in the brain. After injury to the cord, such as results from dislocation or fracture of the vertebræ, with the consequent pressure upon or tearing of the tissues of the cord itself, a paralysis supervenes in the parts of the body below the seat of injury. If the paralysis results from pressure alone without an actual injury to the cord, it may be only temporary, recovery taking place when the pressure is removed. More often there is some crushing of the cord, in which case the paralysis is permanent, its extent depending upon the extent of the injury. When the cord is crushed completely across there is a complete paralysis, both motor and sensory, of all parts below the seat of injury, with the exception of such internal organs as are supplied by nerves which arise above the injury. Tumors, benign or malignant, diseased conditions extending from neighboring tissues and organs, hemorrhages into the spinal canal or into the substance of the cord, etc., determine, by the pressure upon the cord which they cause, paralyses similar to those resulting from injury. The main difference between the two is a clinical one, the paralysis from injury coming on suddenly and immediately after the injury, while the paralysis from disease has a gradual onset. Again, certain diseases of the spinal cord itself cause paralysis. Thus acute anterior poliomyelitis, often called (because of its most prominent symptom and because of its most frequent occurrence in children) acute infantile spinal paralysis, is a disease of the gray matter of the anterior horns and causes paralysis of those muscles governed by the affected cells. In the early stages of this disease the number of cells affected is large, and the paralysis is consequently extensive. Some of the cells are so severely injured that they die, and the paralysis in the muscles which these cells govern is permanent. The majority of the cells first affected usually recover, and this recovery in the cells is marked by a disappearance of the paralysis in the muscles which these cells govern. Among the other diseases of the spinal cord in which paralysis occurs or may occur may be mentioned Landry's paralysis, spastic paraplegia, or spastic spinal paralysis, amyotrophic lateral sclerosis, tabes dorsalis, ataxic paraplegia, and myelitis.

The brain serves as a centre for voluntary motion and for the perception of sensory impulses. It follows that injury to or disease of the brain is frequently followed by paralysis of greater or less extent. Thus concussion of the brain; fracture of the skull with resulting compression due to displaced bone or to hemorrhage in the cranium; hemorrhage into the substance of the brain or into its membranes independent of external injury; compression of the brain from tumors benign or malignant, from syphilitic gummata, etc.; destruction of brain tissue by extension of disease from surrounding parts, as from bone necrosis, middle ear disease, abscesses, etc.; brain softening from cutting off blood supply, as in thrombosis or embolism—all these and other widely different lesions cause paralysis as

a symptom by interfering with the proper working of the nervous mechanism.

There remain to be described somewhat more in detail certain conditions to which the term paralysis is popularly applied.

Hemiplegia is that form of paralysis popularly known as a 'paralytic stroke' or 'stroke of apoplexy.' The paralysis affects only one lateral half of the body. The parts generally affected are the upper and lower extremities, the muscles of mastication, and the muscles of the tongue on one side. In a well-marked case the patient when seized falls to the ground, all power of motion in the affected arm and leg being lost. The paralysis of the face which accompanies hemiplegia is usually quite distinct from the affection known as facial paralysis, which is an affection of the facial nerve or portio dura. (See Nervous System and Brain.) The motor branches of the fifth or trifacial nerve going to the muscles of mastication are generally involved in hemiplegia, and consequently the cheek is flaccid and hangs down, and the angle of the mouth is depressed on the affected side. The tongue when protruded points toward the paralyzed side, and there is often imperfect articulation, in consequence of the lesion commonly affecting the hypoglossal nerve. While paralysis of one side of the body or hemiplegia may be due to a large number of different conditions in the brain or cord, some of which have been already mentioned, it is most commonly due to one of three cerebral accidents. These, mentioned in the order of frequency of their occurrence, are (1) cerebral hemorrhage, (2) cerebral embolism (q.v.), (3) cerebral thrombosis (q.v.). Hemorrhage may occur into any portion of the brain tissue proper or between the skull and brain, i.e. into the meninges. These hemorrhages may be due to injury to the vessels or to disease of the vessel walls such as atheroma or aneurism. The most common seat of hemorrhage is in the optic thalamus and corpus striatum, from the branches of the middle cerebral artery. With the escape of blood there is usually more or less tearing and destruction of brain tissue, and this broken down brain tissue mixed with the extravasated blood constitutes what is known as the apoplectic clot.

Facial Paralysis, although locally affecting but a small part of the body, is of such frequent occurrence as to require separate description. In this affection there is more or less perfect loss of power over all the muscles supplied by the portio dura or facial nerve. This interference with the functions of the nerve may be due to lesions in the cortex affecting facial fibres of the corona radiata or internal capsule, to lesions in the nucleus of the nerve, or to lesions of the nerve trunk. Facial paralysis due to lesions in the cortex is commonly associated with hemiplegia. This paralysis is on the same side as that of the body, the nucleus from which the facial fibres originate being connected with the opposite side of the cortex in a manner quite similar to that by which the anterior horns are associated with the opposite hemisphere. Facial paralysis due to lesions of the facial nucleus in the medulla is uncommon. Tumors, hemorrhages, softening, the toxins of diphtheria, and the extension of an anterior poliomyelitis are the most frequent causes. Lesions of the trunk of the nerve may occur in any part of its course, due to tumors, injury, inflammation, etc. When the lesion affects the nerve fibres as they pass through the lower portion of the pons, and involves also the pyramidal or main motor tracts, there results the so-called 'cross paralysis,' i.e. a paralysis of the face on the same side as the lesion and of the trunk upon the opposite side. The following graphic account of the appearance of a patient suffering from facial paralysis is condensed from Watson, *Lectures on the Practice of Physic*. From one-half of the countenance all power of expression is gone: the features are blank, still, and unmeaning; the eyelids apart and motionless. The other half retains its natural cast, except that in some cases the angle of the mouth on that side seems drawn a little awry, in consequence of want of counterpoise from the corresponding muscular fibres of the paralyzed side. The patient cannot laugh, weep, frown, or express any feeling or emotion with one side of the face, while the features of the other side may be in full play. He cannot spit or whistle properly. One half the aspect, with its unwinking eye, its fixed and solemn stare, might be that of a dead person; the other half is alive and mobile.

If the cause of the paralysis is due to conditions in the nerve external to the cranial cavity, there is little danger to life and good chances for recovery from the paralysis. If, however, the paralysis is dependent upon intra-cranial conditions, there is not only less chance of recovery from the paralysis, but great danger to life.

There yet remain to be considered certain conditions which are popularly called paralyses or palsies, but which are essentially different from those already described. Among these may be mentioned the so-called 'shaking palsy,' or paralysis agitans (q.v.), and the palsies induced by various poisons. The poisons which are the most common causes of paralysis or of tremors are alcohol, lead, tobacco, and mercury. Arsenic and opium are rare causes. It is upon the peripheral nerves that these poisons seem to have their most pronounced effect, setting up a toxic peripheral neuritis.

A specific form of paralysis of the lower extremities, consequent on the use of flour from the beans of the Lathyrus sativus, is common in certain parts of India and Tibet. The ripe bean is an ordinary article of food when made into flour, but it is generally used with wheat or barley flour. It is said to be injurious only when it exceeds one-twelfth part of the mixture and to cause paralysis only when it constitutes more than one-third. Other species of Lathyrus have been known occasionally to cause similar symptoms in European countries.

PARALYSIS AGITANS (Lat., shaking palsy), Parkinson's Disease, Shaking Palsy. A chronic progressive nerve disease, in which the principal symptoms are tremor, muscular rigidity, restlessness, weakness, and altered sensations. It occurs more frequently in males, and generally between the ages of fifty and seventy. It is caused by exposure, hard labor, and great fatigue. Fright or injury may immediately precede an attack. The earlier symptoms are pains in one arm, with tremor of one hand, the fingers working together as if the patient were pulling or picking at something. Stiffness in the arm follows, and the process invades the leg of the same side. The neck becomes stiff and the body

bent forward. The disease lasts from three or four to twelve years. The pathological changes found consist of hypertrophy of the nerve cells of the pons, induration of the pons medulla and cord, thickening of the blood-vessel walls and of the pia, and increase of connective tissue in the motor tracts, nerves, and muscles. (Dana.)

The most successful treatment consists of rest, freedom from mental anxiety, outdoor air, warm baths, and massage. Among drugs, hyoscine, codein, quinine, arsenic, cannabis, veratrum, salicin, nitrate of silver, conium, atropia, and phosphorus have been used to relieve various conditions and with varying results. The mental condition, which may be hysterical or emotional, sometimes delusional, is improved by strong mental influences, routine and control, and employment. Consult Dana, *Text-Book of Nervous Diseases* (New York, 1892).

PARAMARIBO, pär'ä-mär'ī-bō. The capital of Dutch Guiana, South America, situated on the left bank of the Surinam River, about 17 miles above its mouth, in latitude 5° 50′ N. and longitude 55° 10′ W. (Map: Guiana, Dutch, F 2). Its climate is very hot, the average annual temperature being over 80°. Paramaribo has the neat appearance of a Dutch town with its wide streets shaded with trees and lined with bright-colored modern houses. The Government buildings are situated near the river, forming the so-called 'Government plain.' There are a number of churches and synagogues. The harbor is safe and commodious, and fortified by the two forts of Zeelandia and New Amsterdam. A number of wharves are situated along the river. Paramaribo receives the entire trade of Dutch Guiana and is the seat of a number of foreign consuls. Population, in 1900, 31,817, or nearly 50 per cent. of the entire population of Dutch Guiana.

PARAMATTA, pär'ä-mät'ä. A town of New South Wales. See PARRAMATTA.

PARAM'ETER (from Gk. παρά, *para*, beside, beyond + μέτρον, *metron*, measure). As commonly used in mathematics, any constant quantity, that is, a quantity fixed in value, entering into an equation. In analytic geometry it is used either as a constant or as a variable. Thus, the line in a conic section called by the ancient geometers latus erectum, and later latus rectum, and now the parameter, is a constant for any given curve, but a variable quantity for a family of curves of that type. E.g. in the equation of a parabola (q.v.) $y^2 = 2px$, where p is the parameter, p remains constant, while x and y vary so as to generate the curve. But if p be given a new value, while x and y pass again through the same cycle of values, a new parabola will be formed; and by repeating the process any number of curves may be generated which are said to belong to the same family. The method of variation of parameters is an important one in the treatment of differential equations. The name parameter is due to Mydorge (1585-1647).

PARAMUSHIR, pä'rä-mōō'shēr', or **PARAMUSHIRI**. The largest of the Kurile Islands (q.v.).

PARANÁ, pä'rä-nä'. The largest river of South America after the Amazon, and one of the great rivers of the world. It is formed by the confluence of the Paranahyba and the Rio Grande in Southern Brazil at the common boundary point of the States of Matto Grosso, Minas Geraes, and São Paulo (Map: South America, D 5). The Paranahyba rises on the Serra dos Vertentes and flows southwestward on the boundary between Minas Geraes and Goyaz. The Rio Grande, which is the longer of the headstreams, and may be regarded as the true upper course of the Paraná, rises on the Serra da Mantiqueira in the Coast Range, 60 miles from the Atlantic Ocean near Rio de Janeiro. It flows northwest and westward to the confluence, whence the Paraná proper takes a southwest course through Brazil, then south on the boundary between Brazil and Paraguay, whence it curves westward between Paraguay and Argentina until it receives its largest tributary, the Paraguay River (q.v.). From this point the lower Paraná flows southwest through Argentina as far as Rosario, where it finally turns to the southeast, and enters the Atlantic Ocean through the Plata estuary, at the head of which it is joined by the Uruguay River (q.v.). The total length of the Paraná River from the ocean to the source of the Rio Grande is 2950 miles, and excluding the Plata 2720 miles. The length of the lower Paraná from the Paraguay confluence is 850 miles, and with the Plata 1080 miles. The Paraná is thus longer than the Mississippi proper, and the drainage area of the system is nearly equal to that of the Mississippi.

In its upper course the Paraná flows over the great Brazilian plateau, and most of its upper tributaries, including the two headstreams, are obstructed by falls and rapids as they descend over the successive escarpments of the higher plateaus. The main river itself has the fall of Urupupanga a short distance below the confluence of the headstreams. Below this point, however, it is navigable for 600 miles over the level surface of the plateau as far as the boundary of Paraguay. Here it descends over the final great escarpment in the Falls of Guayrá, in which the river plunges through numerous rocky clefts with a total fall of 70 feet. From this point to within 150 miles of the Paraguay confluence the stream rushes through a deep gorge over a series of rocky shallows and rapids. Here the banks are heavily forested, and most of the tributaries fall into the river by cataracts, of which the Victoria Falls of the Iguassú are said to rival Niagara in height and grandeur. Below the gorge and the Paraguay confluence the river flows unobstructed through the Pampas plains, and for the last 1000 miles of its course, including the Plata, is navigable at all seasons by large vessels, while trans-atlantic steamers go directly to Rosario, 400 miles from the ocean. It is 3000 yards wide at Corrientes, near the Paraguay confluence, and 7000 yards wide at Diamante. It reaches its greatest volume at Corrientes, and loses considerably by evaporation in its lower course, since it here receives scarcely any permanent tributaries except the Salado (q.v.). Several hundred miles above the estuary it begins to divide into parallel channels, inclosing a long island, and has a total width of 25 to 30 miles, while some of the channels are two miles wide. The delta proper begins 100 miles from the estuary, and consists of a vast network of channels and backwaters, emptying by 14 mouths into the Plata estuary. The main channel is accessible to the largest vessels even at low water, but all the channels are constantly and

rapids, shifting, calling for great caution in their navigation. For the description of the river below the delta, see PLATA, RIO DE LA. The Paraná was first ascended as far as the Paraguay confluence in 1526 by Sebastian Cabot.

PARANÁ. A southeastern State of Brazil, bounded by the Atlantic Ocean on the east, the State of São Paulo on the north, Paraguay and Matto Grosso on the west, and Argentina and Santa Catharina on the south (Map: Brazil, G 8). Area 85,430 square miles. The low strip of coastland is followed by a mountain range reaching an altitude of nearly 5000 feet and passing into an elevated plateau lying about 3000 feet above the sea. The portion along the western frontier slopes toward the Paraná River, whose tributaries are the chief rivers of the State. Most of them, however, are unfit for navigation, owing to rapids. The climate is generally healthful in the elevated portions, but very hot and humid on the coast. Forests cover a large part of the State, especially in the western half, which is almost unknown, and inhabited by roving Indians. On the coast are cultivated cotton, coffee, and manioc, and in the more elevated regions grain and fruits are raised, but the maté industry is the most important, and maté is almost the only export. The population of the State in 1890 was 249,491, consisting to a great extent of German and Polish immigrants. Capital, Curitiba (q.v.). Consult Lange, *Südbrasilien* (2d ed., Berlin, 1885).

PARANÁ (formerly *Bajada del Paraná*). The capital of the Province of Entre Rios, Argentina, situated on a high bluff on the Paraná River, 370 miles from its mouth and opposite the city of Santa Fé (Map: Argentina, E 10). It is a well-built town with straight streets, good public buildings, a normal school, and a national college. It has an important inter-provincial trade, has daily steamship connection with Santa Fé, and is a station for all steamers ascending the Paraná River. Population, in 1898, estimated at 24,000. From 1852 to 1861 Paraná was the capital of the Argentine Republic.

PARANAGUÁ, pä'rä-nä-gwä'. The chief seaport of the State of Paraná, Brazil, situated on the Bay of Paranaguá, 400 miles southwest of Rio de Janeiro. A regular steamship line connects the port directly with Hamburg, and it exports woods, maté, sugar, and cereals. Population about 6000.

PARANAHYBA, pä'rä-nä-ē'bä, or **PARNAHYBA**, pär'nä-ē'bä. One of the headstreams of the Paraná (q.v.).

PARANAHYBA, or **PARNAHYBA**. A river of Northeastern Brazil. It rises in the Serra das Mangabeiras on the northern boundary of the State of Goyaz, flows northeast for 800 miles between the States of Piauhy and Maranhão, and empties into the Atlantic Ocean at the town of Paranahyba (Map: Brazil, J 4). It is navigable for small steamers through nearly half its length.

PARANAHYBA, or **PARNAHYBA**. A seaport in the State of Piauhy, Northeastern Brazil, near the mouth of the river of the same name (Map: Brazil, J 4). It is the commercial centre of Piauhy, being the only harbor in the State, and the outlet for its agricultural and cattle products. Population, in 1898, about 11,000.

PAR'ANOI'A (Neo-Lat., from Gk. *παράνοια*, madness, from *παρανοεῖν, paranoein*, to be deranged, from *παρα, para*, beside, beyond + *νοεῖν, noein*, to think). A chronic form of insanity in which for many years the intellect of the patient remains unimpaired, though dominated by a systematized delusion. There is almost invariably present an acquired or transmitted neuro-degenerative taint, though an attack may be based on a sudden or severe injury to the nervous system. It may follow a severe fever or an injury to the head. It may equally well be caused by great emotional strain or a constantly harassing thought.

Paranoiacs usually present somatic evidences of degeneration, such as a deformed or asymmetrical skull, badly developed teeth, strabismus, atrophy of one side of the body, and differences in size of hands or feet. In several cases examined by Spitzka anomalies of the cerebrum were found.

Mild forms of paranoia are presented by persons who exhibit perverse acts, morbid ideas, persistence in absurd notions, and who are commonly called 'cranks.' These persons become imbued with an idea and are dominated by it, and talk constantly of it. They are suspicious, consider themselves slighted or the subject of remark. They think they are neglected or martyred, fancy there is a combination against them, and are frequently melancholic. These patients are able to carry on a business or practice a profession.

The variety of paranoia demanding more attention is the ordinary type of chronic delusional lunatic who was eccentric in childhood and hypochondriac in his youth, and is excessively egotistical, whose failures are considered to be due to conspiracy, who betrays delusions of persecution and hallucinations of sight and hearing. The usual delusion of persecution may be replaced by systematized delusions of erotic, religious, or patriotic nature. The paranoiac is usually homicidal, either because of mandatory hallucinations or of persecutory delusions. Early moral control may do much for mild cases, even aborting the psychosis. The regularity of life in asylums, with their discipline, recreations, and employment, is often beneficial. Consult: Séglas, "Paranoia," translated by Noyes, in *Journal of Nervous and Mental Diseases* (New York, 1888); Ferris, "Clinical Notes on a Case of Paranoia," in *Philadelphia Medical Journal* (Philadelphia, May 26, 1900).

PARAPET. See FORTIFICATION.

PARAPH (OF., Fr. *paraphe, paragraphe*, It. *parafo, paragrafo*, from ML. *paragraphus*, from Gk. *παράγραφος*, marginal line, from *παραγράφειν, paragraphein*, to write beside, from *παρά, para*, beside, beyond + *γράφειν, graphein*, to write). An addition to the signature formed by a flourish of the pen, which, during the Middle Ages, constituted some sort of provision against a forgery. Its use is not altogether extinct in diplomacy, and in Spain the paraph is still a usual part of a signature.

PARAPHERNALIA (ML. nom. pl., from Lat. *parapherna*, from Gk. *παράφερνα*, property of a bride above her dower, from *παρά, para*, beside, beyond + *φέρνη, phernē*, dower, from *φερειν*,

pherein, to bear). Articles of wearing apparel and ornament suitable to a wife's station in life, which were given to or acquired by her either before or during marriage. Both the Roman and civil law recognized a special property in the wife, as to her necessary articles of clothing and ornament, and the name and idea were adopted from the above systems into the English law. By the common law the wife's paraphernalia, except articles of absolutely necessary clothing, belonged to the husband during his lifetime and he could dispose of them at his discretion, but on his death the wife could hold them against the heirs and legatees, although not as against creditors.. The husband, however, could not dispose of her paraphernalia by will.

No exact list of articles which may be included under the term paraphernalia can be given, as the rules vary in different jurisdictions. In general, it may be said that the clothing and ornaments must be such as would ordinarily be possessed by a woman in her station in life, and that jewels, etc., given by the husband in excess of his means will not be included. See HUSBAND AND WIFE; SEPARATE ESTATE. Consult the authorities referred to under HUSBAND AND WIFE.

PARAPHRASE (Lat. *paraphrasis*, from Gk. *πάραφρασις*, from *παραφράζειν*, *paraphrazein*, to repeat a statement in different words, from *παρά*, *para*, beside, beyond + *φράζειν*, *phrazein*, to say). In music, a free arrangement of a composition for some other instrument or instruments. Bülow's arrangement of *Tristan und Isolde* is merely a *transcription*, because he puts nothing into the piano score that Wagner has not written in the orchestral score. Liszt's arrangement of the Love-Death is more a paraphrase, because he uses rhythmic figures of his own invention. Also he begins with the motive of the Curse, which in Wagner's score does *not* precede the opening of the Death song. Liszt's transcriptions of the songs of Schubert, Schumann, and others are excellent examples of paraphrases.

PARAPHYSES, păr-ăf'ĭ-sēz (from Gk. *παράφυσις*, *paraphysis*, offshoot, from *παραφύειν*, *paraphyein*, to produce offshoots, from *παρά*, *para*, beside + *φύειν*, *phyein*, to grow). Outgrowths, usually filamentous in form, which are associated with reproductive organs, either sexual or asexual. Among the fungi paraphyses occur in connection with the spore-bearing organs in the formation of hymenial layers, as in Ascobolus, black knot (*Sphæria morbosa*), etc. The best known use of the term, however, is in connection with the mosses, in which the groups of sex-organs, especially the antheridia, are often intermingled with hair-like paraphyses. See MUSCI.

PAR'APLE'GIA. See PARALYSIS.

PARASOL FUNGUS. See MUSHROOM.

PAR'ASANG (Lat. *parasanga*, from Gk. *παρασάγγης*, *parasangēs*, from Pers. *farsang*, parasang). A lineal measure still used by the Persians, and often alluded to by the Greeks. The estimate of its length given by Herodotus, Suidas, Hesychius, and Xenophon, and concurred in by modern travelers, is equivalent to about 30 Greek *stadia*, or $3^{3}/_{4}$ English miles. The word is thought to be derived from *sang* (Persian, 'a stone'), and *para* (Sanskrit, 'end'), in allusion to milestones. Byzantine writers reckoned it at 21 *stadia*; Strabo reckoned it at 30, 40, and even 60 *stadia*. Persian authorities are divided.

PARĀŚARA, pā-rā'shā-rā. A Hindu sage, reputed to be the author of some of the hymns of the Rig Veda, where he is once mentioned (vii, 18, 21) as a friend of Indra. He is said to have been the son of Vasishtha, or, according to the more usual account, of Vasishtha's son, Śakti. The story runs that King Kalmashapada once met Śakti in a narrow path in a thicket, and ordered him out of the way. The sage refused, whereat the King lashed him with his whip, and Śakti cursed him to become a rakshasa, or demon. In this transformation Kalmashapada killed and ate Śakti, together with the other sons of Vasishtha. Śakti, however, had left his wife, Adrishyanti, pregnant, and she gave birth to Parāśara, who was brought up by his grandfather. When he grew up, and was informed how his father died, he instituted a sacrifice for the destruction of all the rakshasas, but was dissuaded from its completion by Vasishtha and other sages. This legend is later expanded, so that, as a reward for his forbearance, Parāśara is said to have been the compiler of the *Visnu purāna*. (See PURĀNA.) There is also attributed to him a law-code, the *Parāsara smrti*, and a subpurana, the *Parāśara-purāna*, which, like some late works ascribed to Parāśara, may have been composed by historical personages bearing this name. The legendary Parāśara is said to have been the father of Vyasa (q.v.) by an intrigue with the Princess Satyavati.

PARASELENÆ. See HALO.

PARASITE (Lat. *parasitus*, from Gk. *παράσιτος*, one who eats at another's table, guest, parasite, from *παρά*, *para*, beside, beyond + *σῖτος*, *sitos*, food). ANIMAL. Animals that feed on the fluids of other living animals that the latter have elaborated for their own use; also on the juices and even solid matters that they get while feeding in the interior of living plants. It is essential to the idea of parasitism that an injury is done to some other living organism within which, or fastened on to which, the parasite lives; and the organism that supports the parasite is called the 'host.'

Parasites are either 'temporary' or 'stationary.' Temporary parasites are those that seek their host only occasionally or for a short time; they may have different individuals as hosts at different times, as is the case with the leech and bed-bug. Stationary parasites are those whose parasitic life continues for a long time, perhaps as long as life, e.g. the tapeworm. Parasites may also be classified as 'ectoparasitic' or 'endoparasitic.' Ectoparasites live chiefly on the skin and are either temporary, as in the case of the mosquito, or stationary, as in the case of the itch mite. Endoparasites live chiefly in the alimentary tract or some other intestinal organ, and are stationary.

ORIGIN OF PARASITIC LIFE. A knowledge of this subject can best be gained by a study of certain groups where all gradations occur from free living to parasitic forms. The first example may be taken from the group Copepoda. Many of these small crustacea swim free in the sea and in ponds. They feed on all sorts of organic débris. One species, Argulus, travels

TABLE OF PRINCIPAL PARASITIC ANIMALS

GROUP	Species	Host	Remarks
PROTOZOA			
Rhizopoda	Some Amœbæ are parasitic.	Alimentary tract of man, mammals, insects.	
Sporozoa	All are parasitic.		Behavior in the body like pathogenic bacteria.
Infusoria	Numerous parasitic forms, e.g.: Balantidium coli.	Colon of man.	
	Trichodinæ.	On gills and gill-cavity of frog.	
	Opalina.	Bladder and gut of frog.	
	Holophyra multifiliis.	Surface of fish.	
	Ancistrum.	Mantle cavity of mussels.	
	Anoplophrya.	Intestine of various marine invertebrates.	
PORIFERA (Sponges)	No true parasites.		Cliona bores in shells of lamellibranchs.
CŒLENTERATA	A very few species: Polypodium hydriforme parasitic at one stage.	Immature ova of sturgeon (Ussow).	
	Cunina, a medusa.	In other medusæ.	
	Edwardsia, an actinian.	In Ctenophora.	
	Pemmatodiscus socialis.	On Rhizostoma (Monticelli, 1898).	
	Gastrodes, a ctenophore.	In Salpa.	
SCOLECIDA			
Turbellaria	A few Rhabdocœla: Graffilla muricicola.	In kidney of the gastropod Murex.	
	Fecampia erythrocephala.	In gut of crab (Carcinus mænas).	
Trematoda (Liver flukes)	All parasitic: Two cases.		
	1. Only one host; young like adult, ectoparasites.	On or in gut and bladder of aquatic animals.	Called 'monogenetic.'
	2. Two hosts; endoparasites.	The asexual generation in Mollusca; the sexual, usually in gut of some vertebrate.	Called 'digenetic.'
Cestoda (Tapeworms)	All parasitic, with or without alternation of generation.	Adults in various vertebrates; young stages also in invertebrates.	Two hosts required for complete development.
Nematoda (Roundworms)	Mostly parasitic.	Plants and animals, chiefly vertebrates.	Complicated life history, frequently with alternation of generations.
Acanthocephela	Four genera, all parasites.	Rarely in man; the young live chiefly in arthropods; the adults in vertebrates, especially fish intestines.	
Nemertinea	Rarely parasitic. Malacobdella.	In lamellibranchs.	
Rotifera	Various species; order Ploïma.	On or in fresh-water Oligochæta.	
	Order Seisonaceæ.	On the crustacean Nebalia.	Marine, form much modified.
POLYZOA	None parasitic.		
MOLLUSCA	Enlima, Stylifer, Thyca.	Holothuria, star-fishes, echinoids.	Imbedded in skin, often forming tumors.
Gastropoda			
	Entoconcha mirabilis.	Inside of Synaptidæ (Holothuroidea).	Attached to blood-vessels or muscles.
	Entocholax, Entovalva.		
	Sistrum.	Certain corals.	
ECHINODERMATA	No parasitic species.		
ANNELIDA.			
Chætopoda (Sand-worms)	Labrorostratus and Hæmatocleptes (Ennicidæ).	In the body cavity of other chætopods.	
	Some species of Polynoë.	In other invertebrates, as crinoids, on which galls are formed.	
	Species of Mysostomidæ.		
Hirudinea (Leeches)	Most species are ectoparasites.	Mollusca, vertebrates.	Temporary parasites, some leeches are carnivorous.
CRUSTACEA	Many Copepoda, e.g.:		
	Argulus.	Surface of fishes.	
	Caligus.	On gills of fishes.	
	Lernæonema.	In flesh of fishes.	
	Some Cirripedia, especially Sacculina.	Crabs; beneath abdomen.	Reduced to mere sacs.
	A few Amphipoda, e.g.:		
	Cyamus.	Skin of whales.	
	Hyperia.	In the jelly of large medusæ.	
	Many Isopoda, e.g.:		
	Ancens.	On the fish Cottus.	
	Bopyridæ	On the gills of Crustacea.	
	Cymothoidæ.	On fishes.	
INSECTA (Insects)	Many plant parasites.		
	Certain groups of animal parasites, e.g.:		
	Mallophaga (bird-lice)	Birds and mammals.	Ectoparasites, on feathers and hairs.
	Pediculidæ (lice).		
	Membranacei (bed-bugs).	Warm-blooded vertebrates.	Temporary ectoparasites.
	Strepsiptera.	Bees and wasps.	
	Aphaniptera (fleas).	Birds and mammals.	Ectoparasites.
	Pupipara (sheep-lice).	Birds, mammals, and bees.	Stationary ectoparasites.
	Culicidæ (mosquitoes) and many other Diptera. Chalcididæ.	Warm-blooded vertebrates.	Ectoparasites.
	Ichneumon flies.	Other insects.	Active in the larval stage.

GROUP	Species	Host	Remarks
ARACHNIDA (Spiders)	Many parasites among Acarina (mites)	Mamm[illegible]ods, and insects.	
	Demodex folliculorum; Pentastomum.	Deb[illegible]ite of man, of young hare, cat, ox, or adult dog, wolf, horse.	A greatly modified arthropod.
VERTEBRATA	Myxinidæ (hag-fishes).	Bore into the body cavity of fishes.	The only parasitic vertebrates.

about on the surface of the body of fish and feeds on their slime. Another genus, Caligus, has taken a further step; it has migrated under the gill-cover of a fish and has attached itself to the gills, receiving food from the blood flowing through them. It is doubtless harmful; it is a true external parasite. Finally other Copepoda, e.g. Lernæonema, have penetrated between the scales and are found imbedded deep in the muscles of menhaden and other marine fishes living entirely on the juices elaborated by them, and typifying a complete internal parasite. We see in this case how living or waste organic matter is by easy gradations to live on and in living organisms.

The nematode worms are chiefly parasitic. Some of the Anguillulidæ, or vinegar eels, however, live in organic fluids. The Ascaridæ, or stomach worms, live for the most part in the organic fluid contents of the intestine, which they still have to digest somewhat, so that they are on the line between messmates (see COMMENSALISM) and true parasites. They are, however, in great danger of being indubitable parasites, and this is the fate that befalls some of their kindred; e.g. *Trichina spiralis*. (See TRICHINA.) Anguillula, Ascaris, and Trachina show how parasitism has arisen in a group that originally had come to live on organic fluids, and especially how those animals that live on the surface of other animals, devouring their excretions (or waste fluids), will easily come to penetrate into the flesh, devouring the vital secretions (or functional fluids). They will pass from scavengers to parasites.

The question why animals which are in a position to become parasites often do become parasites is not difficult to answer. Parasitic life brings great advantages to the parasite. First, it affords an abundant food supply; second, it diminishes the chance of direct attack from other organisms. The great disadvantage of abject parasitism is this, that the parasite is restricted in its environment, and since the body that it inhabits is mortal, it must make special provision for the continuation of the species. In mammals the capacity of infecting the embryo while attached to the mother, would be of great service in insuring this continuity, and a certain threadworm of the dog (*Filura immitis*) has been found to be transmissible from parent to fœtus, as seems to occur in few species. Most parasites depend either upon the flesh of the host being eaten by a second host, or else the young are discharged, encapsuled (to protect them from desiccation or other untoward conditions), and take their chances of being picked up by a suitable host. To increase the chances of the continuity of life from one individual to the next, the fertility of parasites has become extraordinary. Indeed, in the group of copepods, where the embryos are carried in external pouches, one may see how the parasitism becomes more complete as the embryo pouches become larger. Van Beneden states that a single nematode produces 60,000,000 ova. The rich food supply of the parent makes this great fertility possible. In extreme cases the parasite becomes little but an egg-sac. To increase the fertility still more, fission, in the case of cestodes at least, has been added; so that the number of fertile individuals is increased. Since a species is little likely to devour the flesh of its own kind, many parasites may pass successively into two hosts, e.g. the pig and the rat. This has given rise in some cases to an *obligatory* alternation of hosts.

The adaptations in structures of parasites are striking. First, temporary parasites must move over the body of their hosts or go from one host to another. Hence (1) sense organs are developed to direct them in their migrations, and they are provided with locomotor apparatus, e.g. the springing legs of the flea; (2) stationary parasites gain apparatus for holding on, as suckers in cestodes and nematodes, and hooks in mites and copepods. Certain cestodes have both suckers and hooks; in still other cases, as in the degenerate cirriped Saculina, roots or holdfasts are developed, which also serve as imbibitory tubes; (3) endoparasites lose their locomotor organs, for large legs would be a disadvantage to burrowing parasites, such as Demodex, among mites, or unnecessary, as in the copepod Caligus; (4) endoparasites lose also their sense organs, because no longer useful, as is the case in parasitic Copepoda; (5) the alimentary tract becomes degenerate in extreme forms, because food is gained by osmosis through the body wall (e.g. cestodes). In less extreme cases the alimentary tract is simplified on account of the absence of necessity for digestive apparatus.

ECONOMICAL CONSIDERATIONS. The number of animal parasites harbored by one host may be enormous. Thus, in a young horse Krause found 500 Ascaris, 190 Oxyuris, several millions of Strongylus, 214 Sclerostomum, 287 Filaria, 69 Tænia adult and 9 immature. The destruction wrought by these parasites is sometimes very great. It is estimated that half a million pullets die yearly in England from "gapes," caused by a threadworm (*Syngamus trachealis*). England in 1880 was estimated to be losing about 1,000,000 sheep annually from liver-flukes. Fortunately, the United States has been visited by no such scourges, but scores of cattle regularly die of the liver-fluke in this country. The United States Bureau of Animal Industry makes official investigations into epidemics of parasites among the higher animals.

BIBLIOGRAPHY. Leuckart, *The Parasites of Man and the Diseases Induced by Them* (trans. by Hoyle, Edinburgh, 1896); Ghenmann, *Treatise on the Parasites and Parasitic Diseases of the Domesticated Animals* (trans. by Fleming, London, 1892); Van Beneden, *Animal Parasites and Messmates* (ib., 1876); Maniez, *Les parasites du [illegible]* Paris, 1888).

PARASITE. Plant. The plant kingdom presents abundant illustrations of parasitism, from the lowly bacteria to such complicated flowering plants as the mistletoe and dodder. A number of the immense group of fungi must also be either a saprophyte (q.v.) or a parasite, and some entire groups have adopted the latter habit, the most disastrous of the plant diseases being due to fungous parasites. The potato rot and grapevine mildew are caused by members of the Peronosporales. (See Phycomycetes.) The Ustilaginales (q.v.) are responsible for smut, and the Uredinales (q.v.) for rusts. Some of the leaf-curls are caused by an Ascomycete, and certain important blights and wilts by bacteria. Some very characteristic diseases of insects are the result of fungous parasites from among the Phycomycetes (q.v.) and Ascomycetes (q.v.). The adaptations developed by many of these parasites to adjust themselves to their hosts are remarkable, and lead to some very complex life histories. A life of parasitism appears to result in sexual degeneration (see Fungi), so that, associated with remarkable specialization of vegetative regions, there is in a number of groups the entire loss of sexuality. There are also some remarkable parasites among the flowering plants, the dodder (Fig. 1) being an extreme example of complete dependence upon its host, the root disappearing, the leaves being mere scales, and the flowers much reduced. Other plants have well-developed green leaves, and yet always grow with their roots or other parts connected with some host which supplies certain of their wants. Among these may be mentioned the mistletoe (Viscum), Euphrasia, and Pedicularis, the first-named probably depending upon its host for almost all the water that comes to it. Parasites establish relations with their hosts generally by sucker-like structures, called haustoria (q.v.), or, as in the fungi, through delicate processes which pierce the cell walls (Fig. 2). See also Symbiosis.

Fig. 1. Dodder (*Cuscuta*) parasitic on a hop stem.

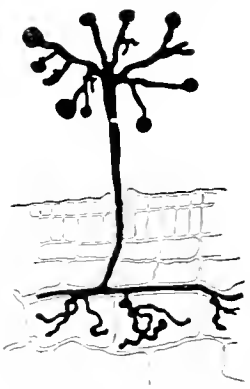


Fig 2. Diagram of fungus parasitic in the tissue of the host plant and forming spores above the surface.

PARASITIC DISEASES. An important subdivision in the classification of diseases. (See Nosology.) In these diseases certain morbid conditions are induced by the presence and vital activities of various low forms of animal or vegetable life, which have found lodgment and subsistence in some tissue or organ, or upon some surface of the body of man or animals. Even plants are not exempt from disorders of this nature. See Parasite, Plant.

The vegetable microörganisms which cause disease are far more numerous and important than the animal, but are as yet less perfectly understood. They may be divided into three classes: (1) the *Blastomycetes* or yeast fungi; (2) the *Hyphomycetes*, or molds; and (3) the *Schizomycetes* or bacteria.

(1) The yeasts are important only as causes of fermentation. One member of the family, however, is pathogenic, and grows upon the mucous membrane of the mouth and throat. This is the *Oidium albicans*, and the disease it gives rise to is called thrush (q.v.). Yeasts are common in the stomach, being introduced with the food, and are found in diabetic urine.

(2) The pathogenic molds are found upon the surface of the body, since they require free oxygen for their growth. They are responsible for many skin diseases. Favus (q.v.) is caused by the *Anchorion Schönleinii*. *Pityriasis versicolor*, also called chloasma, is caused by the *Microsporon furfur*. *Actinomycosis* (q.v.) is due to infection by the ray fungus (actinomyces). *Madura foot* is a serious disease, occurring in the feet of natives of India, and was shown in 1861 by Carter to be due to a fungus—*Chionyphe Carteri*.

(3) The Schizomycetes or bacteria are by far the most important and interesting of the vegetable parasites. They penetrate every tissue of the body and are known to be the cause of most of the specific febrile diseases, and are suspected to be the cause of others. The study of these organisms has almost reached the dignity of a separate science. See Bacteria.

PARATOLOID. See Tuberculin.

PARAY-LE-MONIAL, pä'rā'-le-mō'nyāl'. A town in the Department of Saône-et-Loire, France, on the Bourbince, 32 miles northwest of Macon (Map: France, L 5). Its Benedictine abbey, founded in 973, contains the tomb of Marguerite Marie Alacoque (q.v.). The revelations said to have been made to her here greatly stimulated the devotion to the Sacred Heart of Jesus (see Sacred Heart of Jesus, Feast of the), which has been so marked a feature of Roman Catholicism in the last two centuries. Paray-le-Monial has consequently become a popular pilgrimage centre, and large numbers, even from America, visit it annually. Population, in 1901, 4362. For an account of the apparitions, consult Bougaud, *Histoire de la bienheureuse Marguerite Marie* (Paris, 1894).

PAR'CÆ (Lat., fates; connected with *parere*, to bring forth, hence originally *Parca*, a goddess of childbirth; later associated by popular etymology with *pars*, part, identified with the Gk. Μοῖρα, *Moira*, and then tripled into three *Parcæ* to correspond to the three *Μοῖραι*, or Fates). The name given by the Roman poets to the Greek Moiræ, or goddesses of fate. They have no place in Roman worship, though the name appears in Gallic territory applied to Celtic divinities, who are also called Fati (masculine) or Fatæ (feminine). In the poets they

PARASITIC FLOWERING PLANTS

play an important part as spinners of the thread of life. Among the Greeks the conception of the Moiræ is somewhat different. The name in the singular denotes the portion of life allotted to each man at his birth, with the inevitable death at the appointed moment. In Homer Moira is the goddess who allots this portion to man, though it is often hard to tell whether the word is a proper name or a common noun, destiny. Here we find, however, Moira or Aisa as a spinner of a thread of destiny for every man at his birth, or in one place associated with the *Klothes*, or spinners, who work under her direction. From this idea of the spinner of the thread of life developed the conception of two or three goddesses who begin, control, and end this thread, but the *Moirai* are only once named in Homer, and their development in the cult is of a later date. In Hesiod they appear as the three daughters of Zeus and Themis—Clotho, the spinner; Lachesis, the assigner of the lot; Atropos, the inflexible, who cuts the thread. They were worshiped in Athens, Corinth, Sicyon, Sparta, Thebes, and elsewhere. They are gloomy, invisible goddesses, who know the future and at times reveal it. Their cult was in some places without images, and their offerings those appropriate to chthonic divinities. To them honors were paid not only in connection with birth and death, but at any important epoch in human life. To a later period belongs the close division of functions between the three sisters, which does not appear in art till Roman times. In the earlier art they are not distinguished as individuals, but are only represented as fully draped female figures of youthful dignity. The so-called Fates of the Parthenon pediment are not certainly identified. Later Clotho is regularly indicated by the spindle, Lachesis with a globe on which she traces the fate or little rods from which she draws the lot of man, and Atropos by a roll or tablet in which she records man's fate, or the sun-dial to which she points. The relation of the Moiræ to the gods is not always clearly defined. In Homer the decree of Moira is in accord with the will of Zeus, and once determined cannot be altered. Later writers, while keeping the connection with Zeus, seem at times to regard the Moiræ as binding even the gods. Later philosophical speculation naturally gave much attention to the Fates, and even in popular belief they held a high place among the gods.

PARCELS. See Baggage; Carrier, Common.

PARCENARY (OF. *parcenerie*, from *parcener*, partner, from ML. *partionarius*, having a share, from Lat. *partitio*, share, from *pars*, portion). In law, the state or estate of two or more persons, called *parceners*, who hold title to lands that have descended to them as equal heirs, so that though the estate is undivided each has a right to a separate share of it, and, therefore, with no benefit of survivorship. See Coparcenary.

PARCHÉ, pär'shā'. One of the small, beautiful coral-fishes or butterfly-fishes (*Chætodon capistratus*) common in West Indian waters. The name 'parché' is sometimes applied to all the butterfly-fishes. See Plate of Coral-Fish.

PARCHIM, pärk'im. A town in the Grand Duchy of Mecklenburg-Schwerin, Germany, situated on the Elde, about 20 miles southeast of Schwerin (Map: Germany, D 2). It has a monument to Field-Marshal Von Moltke, a native of the town, a gymnasium, and manufactures of cloth, chicory, cellulold, etc. Parchim is one of the richest cities of Mecklenburg, owning a good deal of the surrounding land. Population, in 1900, 10,242, chiefly Protestants.

PARCHMENT (OF., Fr. *parchemin*, from Lat. *pergamina, pergamena*, from Gk. παργαμηνή, parchment, from Πέργαμος, *Pergamos*, relating to Pergamus, from Πέργαμος, *Pergamos*, Πέργαμον, *Pergamon*, a city of Mysia in Asia Minor, whence parchment was originally brought, and Vellum (from OF. *velin*, Fr. *vélin*, *vélum*, from ML. *vellanus*, relating to a calf, from Lat. *vitulus*, calf; connected with Gk. ἰταλός, *italos*, Skt. *vatsa*, calf, from *vatsa*, Gk. ἔτος, *etos*, year). Parchment is one of the oldest of writing materials, known at least as early as B.C. 500. Herodotus speaks of books written upon skins in his time. Pliny, without good grounds, places the invention as late as B.C. 190, stating that it was made at Pergamum in the reign of Eumenes II., in consequence of Ptolemy of Egypt having prohibited the exportation of papyrus. Possibly the Pergamian invention was an improvement in the preparation of skins, which had certainly been used centuries before. The manufacture rose to great importance in Rome about the first century B.C., and its use spread over all Europe, and retained its preëminence until the invention of paper from rags.

Parchment is prepared from the skins of sheep and goats; vellum, from that of calves, kids, and dead-born lambs; the thick, common kinds, for drums, tamborines, battledores, etc., from those of old goats and in Northern Europe from wolves; and a peculiar kind is made from asses' skins, the surface of which is enameled. It is used for tablets, as black-lead writing can be readily removed from it by moisture. The method of making parchment is at first the same as in dressing skins for leather. The skins are limed in the lime pit until the hair is easily removed. They are then stretched tightly and equally upon a square wooden frame called a horse. The flesh side is dressed as in currying, until a perfectly smooth surface is obtained. It is next ground by rubbing over it a flat piece of pumice stone, previously dressing the flesh side only with powdered chalk, and slaked lime sprinkled over it. It is next allowed to dry, still tightly stretched on the frame. The drying process is an important one and must be rather slowly carried on, for which purpose it must be in the shade. Sometimes these processes have to be repeated several times, in order to insure an excellent quality, and much depends upon the skill with which the pumice stone is used, and also upon the fineness of the pumice itself. Vellum is prepared with the finest pumice. When quite dried the lime and chalk are removed by rubbing with a soft lambskin with the wool on.

PARCHMENT, Vegetable, or Parchment Paper. When pure unsized paper is dipped into a mixture of one part of water and six parts of sulphuric acid, and then washed carefully until every trace of acid is removed, a product is obtained in which the cellulose of the paper has changed into amyloid or hydrocellulose, which forms a gelatinous coating over the fibers, and acts as a sizing. The parchment-like

paper produced is translucent, and its strength is increased threefold. A long-fibred unfilled paper is preferred for the manufacture of this parchment. A similar product is obtained by treating unsized paper with a solution of ammoniacal cuprous oxide, or zinc chloride. After dipping the paper into the bath it is passed over hot rollers and then cooled and washed in pure water to remove all excess of the solution, after which it is dried in a heated room, given a coat of paraffin oil, and calendered. Such parchments are extensively used for covering the corks of bottles and for similar purposes.

PARDESSUS, pär'de-sy'. JEAN MARIE (1772-1853). A distinguished French jurist and publicist, born at Blois, August 11, 1772. He was educated to the law and early became distinguished for learning and eloquence. He was made associate judge in his native city at thirty, and mayor of Blois in 1805. His *Traité des servitudes*, published in 1806, established his reputation as a jurist, and a writer of force and eloquence. It quickly reached eight editions. In 1809 he published *Traité du contrat et des lettres de change*, subsequently published under the title of *Cours de droit commercial*, which was considered the masterpiece of its time. His works on maritime law, *Collection des lois maritimes antérieures au XVIIIème siècle* (6 vols., 1828-45), *Us et coutumes de la mer* (1847), and his *Collection des ordonnances des rois de France*, were equally esteemed. In 1810 a professorship of commercial law was created for him in the law department of the Collège de France, where his lectures were notable. In 1815-16 and again in 1824-27 he was a member of the Chamber of Deputies. After the Revolution of 1830 he retired from public life. He died at Blois, May 26, 1853.

PARDO, pär'dō. MANUEL (1834-78). A Peruvian statesman, born in Lima. He was educated in Santiago de Chile and in Europe, studied law and political economy, and received a Government position in the Lima Bureau of Statistics in 1853. Five years afterwards he was elected to the board of charities, and, forgetful of self, did much to check the yellow fever epidemic of 1867. In 1862 he founded the first bank in Lima. He entered the Cabinet of President Mariano Prado in 1865, was president of the Tribunal of Commerce in 1868, Mayor of Lima (1869), and President of Peru in 1872-76. He was the first civilian to hold that position, and his decrees in the interests of science, literature, and the public peace caused the people to remember him as a good ruler. He was afterwards president of the Senate. Probably at the instigation of officers who bore Prado ill-will for having reduced the army, he was assassinated in front of the Hall of Congress by a sergeant.

PARDO BAZAN, bä-thän'. EMILIA (1851—). A naturalistic Spanish novelist and critic. She was born at Coruña, September 16, 1851. After her marriage in 1868, she went to Madrid, where she witnessed the revolutionary outbreak of that year. In 1876 she won a prize offered by the municipality of Oviedo for an essay on the Benedictine monk Benito Jerónimo Feijóo, well known in eighteenth-century Spanish literature. Essays published soon afterwards in the *Ciencia Cristiana* showed her an Ultramontane, perhaps a Carlist, but ere long Señora Pardo Bazán underwent a change, inevitable to a follower of naturalism or of nature. A journey through France, England, and Italy followed. Later she settled at Madrid, where she started her critical review, the *Nuevo Teatro Crítico*. She gained great repute as a leading representative of the naturalistic school of novelists, and as one of the most capable of modern literary critics. To some extent she is a disciple of Zola, whose determinism, however, she condemns, although in her two strongest novels, *Los pazos de Ulloa* and *La madre naturaleza*, in which she describes the decay of an aristocratic family, she is close to those very pornographic methods of Zola that she has stigmatized. But she is no mere imitator, for her realism is Spanish rather than French, and she does not limit her pictures of man and nature to the evil side only, but seeks rather a broad outlook on life. In *El cisne de Vilamorta* the ending is so romantic as to set at naught her naturalistic theories. Her descriptions of the life in her native Galicia are successful. Of her novels there may be mentioned, besides the three noted above, *Pascual López; Un viaje de novios; La tribuna; La dama joven; Insolación; Morriña; Una cristiana; La prueba; La piedra angular;* and of her essays and critical treatises, *San Francisco de Asís; De mi tierra* (1888); *El Padre Luis Coloma; Pedro Antonio de Alareón; La revolución y la novela en Rusia* (1887); *La cuestión palpitante* (4th ed. 1891), rhetorical essays dealing with realism and naturalism in the modern novel; *Polémicas y estudios literarios*, a supplement to the matter contained in the *Cuestión palpitante*, embracing also the account of her quarrel with the novelist, Pereda, and a review of some of the works of Galdós, etc. As a critic, Emilia Pardo Bazán is fairly keen in her analysis, tolerably sure in her judgment, and forceful in her language. Consult her *Obras completas* (1891, ff.), and her *Nuevo Teatro Crítico* (1891-93).

PARDOE, pär'dō. JULIA (1806-62). An English author born at Beverley, Yorkshire. Her father was Major Thomas Pardoe. She traveled in Portugal, was with her father for a time at Constantinople, and visited Hungary. Since Lady Mary Montagu, no woman had ever acquired so close a knowledge of Turkish life and manners. In 1859 she was granted a civil list pension of £100. She died in London, November 26, 1862. In her fourteenth year Miss Pardoe published a volume of verse, which went into a second edition. Afterwards she became a popular novelist, writing *Lord Morcar of Hereward* (1829), *The Hungarian Castle* (1842), etc. Her miscellaneous works are descriptions of the lands and peoples she had visited and graceful essays on French history. Among them are: *Traits and Traditions of Portugal* (1833); *Louis XIV. and the Court of France* (1847); *The Court and Reign of Francis I.* (1849; reprinted with memoir 1887); *Life and Memoirs of Marie de Medici* (1852); *The Romance of the Harem* (1839); *The Beauties of the Bosphorus* (1839); *The City of the Magyar* (1840); and *Episodes of French History During the Consulate and t[illegible] First Empire* (1859).

PARDON (OF., Fr. *pardon*, from ML. *perdonum*, pardon, from *perdonare*, to grant, from Lat. *per*, through + *donare*, to give, from *donum*, gift). An act of grace, exercised by a com-

petent authority, remitting the penalty imposed by law upon a person who is either guilty or accused of a crime or offense against the Government. The earliest records of governments contain instances of the exercise of such a pardoning power by the sovereign authority, relieving an offender from the consequences of a violation of a tribal rule, or later of a national law. The main reasons for vesting the chief executives of modern nations, with the wide discretion which they exercise in this regard are to prevent injustice because of the fallibility of human laws, which sometimes work hardship in individual cases, although they may be salutary on the whole; the possibility that a person may be unjustly accused and convicted, which may not be discovered until long afterwards; to make it possible for the supreme authority to release persons convicted and sentenced under laws which are later considered harsh and oppressive, especially political offenders convicted in a time of great public excitement and discord, as during or at the close of a civil war; and to enable the chief executive to reward in this manner repentance and good conduct in prison, where he is satisfied that a thorough reform has been effected, and justice satisfied.

In England this power has always been vested in the King, and in early times seems to have been shared to a certain extent by the Lords of the Marches. In 1536 a statute was enacted (27 Hen. VIII., ch. 24) restricting the right to the King, and prohibiting him from delegating it to any subject within the realm. At present the Crown exercises its prerogative upon the advice of the Secretary of State. Parliament has imposed certain restrictions on the power to pardon from time to time. A pardon cannot be pleaded as a defense to an impeachment by the House of Commons. By the 'Habeas Corpus Act' of 1679, the Crown cannot pardon the offense of sending a person to prison without the realm. Where the pardon of an offense will work an injury against an innocent person, it will only be operative as far as the culprit's liability to punishment by the Crown is concerned, and will not affect his civil liability to a person injured by his crime.

In the United States the power to pardon offenses against the national Government is vested, by the Constitution, in the President. His power is absolute, except as to impeachments of public officers, and rests entirely in his discretion, not being subject to legislative control. Perhaps the greatest number of pardons are granted to soldiers guilty of a breach of the military regulations, especially to volunteers who are unused to rigid military discipline. In most of the States the pardoning power is vested in the Governor alone. Several of the States require the concurrence of one branch of the Legislature, and in a few boards of pardon have been established, of which the Governor is a member *ex officio*. Applications for a pardon are usually presented in the form of petitions, affidavits of responsible people as to the extenuating circumstances of the case, and the previous good character of the convicted person; and formal rings on such applications are often held. The necessity for the exercise of this power is greatly lessened in some States by statutes allowing a graduated commutation of a term of imprisonment as a reward for repentance and good conduct in prison. Many penal statutes also allow wide discretion to the trial judge as to sentence to be imposed, in the exercise of which he considers extenuating circumstances, etc., just as a Governor would do on an application for a pardon. The system of releasing prisoners on probation, and suspending sentence of convicted persons, is also a development of the idea of pardon.

Conditional pardons are sometimes granted. For example, a prisoner may be released on condition that he leaves the State forever. On violation of the condition, the ex-prisoner is again remanded to serve out his original term. A general pardon extended to political offenders, such as rebels, is usually called an act of amnesty (q.v.). A pardon is more sweeping in its effect than a reprieve, which only operates as a suspension of sentence. A full pardon effects a remission of the punishment and removes the legal disabilities which follow conviction, so that a person who is pardoned is, in law, as innocent as if he had never committed the crime, except that it does not restore forfeited property or fines. In New York, where a final conviction of murder and sentence of death operate as an absolute divorce of husband and wife, if the convicted spouse is pardoned, the marital relation is not thereby restored. A pardon obtained by deception or fraud is void, and on discovery of this fact the convicted person may be again committed to serve out his term. Consult the authorities referred to under CONSTITUTIONAL LAW; CRIMINAL LAW.

PARDONER'S TALE, THE. In Chaucer's *Canterbury Tales*, the story of three rioters who pledge themselves to find and destroy Death, who, they are informed, is under a certain tree. There they find a treasure. One is sent for food, and poisons the wine, while the others conspire to murder him when he returns. All three are killed.

PARDUBITZ, pär'dy-bits. A town of Bohemia, Austria, situated at the confluence of the Chrudimka with the Elbe, 12 miles south of Königgrätz (Map: Austria, D 1). It has an old palace, a large Rathaus, and a higher *Realschule*. Its manufactures comprise spirits, agricultural machinery, iron products, musical instruments, etc. Population, in 1890, 12,367; in 1900, 17,029, chiefly Roman Catholic Czechs.

PARÉ, pä'rä', AMBROISE (1517-90). A French surgeon, born at Laval, Department of Mayenne. He was apprenticed to a barber in Paris, studied anatomy and surgery, and in 1536 entered the army as a surgeon. During the military operations in Italy he acquired a great reputation as a skillful surgeon. He introduced the practice of ligating arteries in bleeding wounds, in place of the fashion which then prevailed of cauterizing them with boiling oil. Although he made many other improvements in the art, it is on the ligating arteries that his fame as 'the father of modern surgery' chiefly rests. On his return to Paris in 1539 he was received with distinction by the Royal College of Surgery, and was subsequently made its president. War being renewed, he again entered active service. At this time also he substituted ligatures of the arteries after amputations for cauterization, and many other important improvements in surgery were introduced by him. Returning to Paris, he ors

were showered upon him, and though he was ignorant of Latin, the *conditio sine qua non* of a liberal education at that time, learned titles and degrees were conferred upon him.

Paré's writings have exercised a profound influence on the practice of surgery, and particularly in the treatment of gunshot wounds. The first complete edition of Paré's works appeared at Lyons in 1562; the last, edited by Malgaigne, at Paris in 1840-41. Besides these are eight Latin editions, and more than fifteen translations. His principal work was *Cinq livres de chirurgie* (1562). Consult: Stephen Paget, *Ambroise Paré and His Times* (1897), and the *Life* by Paulmier (Paris, 1884). See SURGERY, MILITARY; and MEDICINE, HISTORY OF.

PAR'EGOR'IC (Lat. *paregoricus*, from Gk. *παρηγορικος, parēgorikos*, soothing, from *παρηγορος, parēgoros*, consoling, from *παρα, para*, beside + *ἀγορεύειν, agoreuein*, to talk in assembly, from *ἀγορά, agora*, assembly). The *camphorated tincture of opium* of the United States pharmacopœia. An alcoholic solution of opium, benzoic acid, camphor, and oil of anise, every fluid ounce containing two grains each of opium, benzoic acid, and camphor, and two minims of oil of anise. This preparation is much used both by the profession and the public. It is an excellent remedy for the chronic winter cough of old people, the opium diminishing the bronchial secretion and the sensibility of the pulmonary mucous membrane, while the benzoic acid and oil of anise act as stimulating expectorants. The volatile oil and camphor render paregoric particularly useful in diarrhœa. The preparation is often improperly given to children by careless or ignorant parents to quiet them and relieve pains in the bowels. Children are peculiarly susceptible to opium, and much harm is done by its regular administration.

PAREIRA BRAVA, pá-rā'rá brä'vá (Port., from Brazilian *parcira*, the native name, and Port. *brava*, brave, strong). The root of Chondodendron tomentosum, used to some extent medicinally as a diuretic, which for a century was supposed to be the root of Cissampelos Pareira, but was identified by Hanbury in 1873. The plant is a tall, woody climber, a native of Brazil and Peru, belonging to the order Menispermaceæ. It has large, ovate-cordate, fine-nerved leaves, very small unisexual flowers, and purplish-black, ovoid one-seeded drupaceous fruits, resembling grapes. As it comes to market the root is in short, thick, dark-brown pieces externally ridged and fissured transversely and irregularly furrowed longitudinally. It is nearly inodorous and has a bitter taste. The stem is sometimes found mixed with the root, which it much resembles, but may be distinguished by the pith. The roots of several other menispermaceous plants have been sold for pareira brava, among which is a yellow pareira brava exported from Brazil, in the form of flat, twisted stems which have been thought to be obtained from Aristolochia glaucescens. It may be detected by the eccentric arrangement of its woody zones, which in the genuine are symmetrically concentric. See CISSAMPELOS.

PAREJA, pá-rā'hä, JUAN DE (1606-70), called El Esclavo (the slave). A Spanish religious and portrait painter. He was born at Seville, the son of Moorish parents, and was the slave of Velazquez. He assisted his master in the studio, all the while secretly studying his art. By an artifice he succeeded in bringing one of his pictures to the attention of Philip IV., while he was visiting Velazquez's studio, who immediately set him free. After his emancipation he continued to serve Velazquez, though enrolled among his pupils, and after the latter's death he served his daughter. His paintings, which include portraits and religious subjects, are quite in the manner of his master. The most notable are: "The Calling of Saint Matthew," in the Prado Museum, Madrid; "Baptism of Christ," Santa Trinidad, Toledo; "Madonna de Guadalupe," in the Recollet Monastery at Madrid; "Capuchin Monk," Saint Petersburg; "Portrait of a Boy," Dulwich.

PARENCHYMA, pär-ĕn'kĭ-mâ (Neo-Lat., from Gk. *παρέγχυμα*, tissues of the lungs, liver, kidneys, and spleen). A plant tissue composed of living (usually thin-walled) cells whose three dimensions are approximately equal. Sometimes the term is applied to elongate cells. See HISTOLOGY.

PARENT AND CHILD. Under this head are usually treated the legal relations which exist between father or mother and children. The legal is to be distinguished from the natural relation, for two persons may be by the law of nature parent and child, while they are not legally or legitimately so. Conversely, the legal relation may exist although there is no natural relation. Hence a radical distinction exists between natural or illegitimate and legitimate children, and their respective legal rights with relation to their parents are very different.

EARLY LAW. While the legal relationship between mother and child has always been based on the fact of maternity, that between father and child was originally based, not on the fact of paternity, but on the husband's power over the child's mother. Marriage (q.v.), as we find it at the dawn of European history, was the appropriation of the woman by the man; and as the husband's power was originally not differentiated from other property rights, so the power of the father over children born of the wife was originally indistinguishable from ownership. Wife, children, slaves, and things were equally in the 'hand' (Latin manus, German *Mund*) of the head of the house. The father had the power of life and death over the child; he had also the right to sell the child. The marriage of a daughter, which put her in the 'hand' of her husband, and which usually took the form of a sale to the husband, of course carried her out of the father's power, and paternal authority over the son ended, among most of the Indo-European peoples, when the son established a household of his own. The life-long *patria potestas* (q.v.) of the Roman father seems to have been exceptional; it was connected with the Roman custom by which the son brought his wife into his father's house.

Of maternal authority over children, even when illegitimate, there is little trace in early law, because the woman was regularly herself in the 'hand' of father or husband or kinsman during her whole life. In early Frisian law, however, the mother had the same right as the father to kill her new-born child.

The earliest restraints upon the power of the

head of the house were exercised by his kinsmen, and to some extent by those of his wife, and, when the family was recognized as a religious institution, by the priests. These restraints, which at an early period began to lift the wife out of the position of a mere chattel, affected but slightly the position of the child. (For that of the Roman child, see PATRIA POTESTAS.) In the old German law (heathen period) the infant was not to be exposed after it had been sprinkled with water and had received its name; nor was a child to be put to death subsequently without cause; nor was a child to be sold except when the parents were in dire need. With the acceptance of Christianity by the Germans, the right of exposure disappeared, but the paternal power of punishment for crime and of sale in case of necessity were not at first affected. As regarded personal property, all that the unmarried daughter or the son living in the paternal house acquired was acquired for the father. As regards property, however, the children's eventual rights were protected; inherited realty of the parents was 'tied up' (*verfangen*) in the interest of the children, and a sale by the father conveyed no perfect title to the purchaser.

MEDIÆVAL LAW. In the course of the Middle Ages the authority of the father assumed more and more the aspect of a natural guardianship. The mother, also, with the disappearance of the rule that women were themselves always under guardianship, acquired a subordinate authority. After the death of the father, or when he was incapable of exercising control over the children, the mother became the natural guardian (at least of the persons) of her children.

The canon law introduced in the mediæval law of parent and child but one important modification, viz. legitimation of children born out of wedlock by subsequent marriage between the parents. This rule was borrowed from the Roman law, but was extended by the Church: at Roman law it applied only to children of a concubine, at canon law it applied to all illegitimate children. When it came, however, to recognizing such children as heritors, the Church encountered obstinate resistance. In many parts of Europe German law held its own, especially as regards the inheritance of entailed estates. The reception of the law-books of Justinian (see CIVIL LAW) had little influence upon the European law of parent and child, for the patria potestas of the Roman law was not generally received.

MODERN EUROPEAN LAW. In modern European law maternity is purely a question of fact; paternity is based on the presumption that the child born or conceived in wedlock is the husband's child, but proof of the contrary is permitted. The child born out of wedlock, if 'recognized' by the father, or if the fact of paternity be established by judicial inquiry, is entitled to support up to a certain age, and has rights of succession (q.v.) in the paternal estate, but not the same rights which belong to legitimate children. In the French law, however, inquiry into the paternity of the illegitimate child is prohibited, and such a child has no rights against the father unless it has been recognized. The legal relation of the parent and child is regularly established by birth in wedlock, by legitimation, and by adoption. A child born out of wedlock is legitimized by the subsequent marriage of the parents accompanied by recognition of the child; and in some countries (e.g. in Spain and in Germany) the child may be legitimized by administrative decree issued at the father's request. Adoption (q.v.) is usually permitted only when the adopting parent is childless. Legitimation and adoption generally give parent and child the same rights which pertain to the parent and to the child born in wedlock, but this is not always the case.

The authority of the parent over the person of the child is that of a guardian; i.e. the element of duty is more emphasized than that of power. In the exercise of parental authority the voice of the father is decisive, so that the parental rights of the mother become legally effective only when the father is dead, or when he is unable to exercise his rights or has been deprived of them by a decree of court. The administration of the property of children belongs to the parents (to the father as of right; to the mother, usually, only with the authorization of the family council or the court), and in most of the codes the parents are not obliged to account for the income, their rights being those of usufructuaries; but where property is given or bequeathed to a child, the donor or testator may exclude this parental usufruct and even the parental administration. The parental usufruct is also excluded as regards money and property acquired by the child's separate labor and industry. In case of divorce or annulment of marriage, the control of the persons and the property of the children is regulated by order of the court. The authority of the widow or divorced wife over her children and her usufructuary rights are, in all civil legislations, impaired by her remarriage; and the German law makes provision for safeguarding the interests of children of the first marriage when the father marries again. Parental authority is extinguished when the child reaches full age or is emancipated. In many legislations, however, parental consent is necessary for the marriage of a child even after the child has reached full age. See MARRIAGE.

In all European legislations parents, like other guardians, are subject to the control of the State, exercised through the courts; and they are usually incompetent to alienate real estate belonging to the children without the authorization of the proper court.

The chief duties of parents are the suitable support and education of their children. In many of the civil codes they are also bound to provide daughters with dowries (so at Spanish and German law); but this is not the case at French law, the Code Napoléon following the old maxim, 'ne dote qui ne veut.' Parents are responsible for debts contracted by their children without their authorization only as a result of the duty of support and education (i.e. they are liable only for necessaries). In most legislations they are liable for all torts committed by children; at German law, however, the parent is responsible only when the tort could and should have been prevented by him, i.e. when he has failed to exercise proper surveillance and control.

THE COMMON LAW.

LEGITIMATE CHILDREN. The parents are the legal as well as the natural guardians and protectors of the child. They have the legal right

to raise the child and are entitled to his custody. As such custodians, they or persons *in loco parentis* may reasonably chastise the child, but for excessive punishment, amounting to willful or malicious cruelty, the parent may be civilly liable in an action of tort (although in some States this liability has been denied on grounds of policy), or criminally liable for assault, or homicide in case death ensues. At common law the parents could not be deprived of the custody and control of the child by third parties, but by modern legislation officers having supervision over public charities, and in some States private charitable corporations, are authorized to acquire custody of the child, if subjected to cruel or improper treatment by the parents, by means of a properly instituted legal proceeding. At common law, as between the father and mother, in case they were living apart or divorced, the father was deemed to be entitled to the custody of the child, but by the Statute 36 and 37 Vict., c. 12, the mother was entitled to apply to the Court of Chancery for custody of the child, which the court in its discretion might award to her if it appeared to be for the best interests of the child. It is now the practice of courts generally in the United States, even in the absence of statute, to award the custody of the child to the parent best qualified and able to care for and educate the child.

In case of divorce or judicial separation of the parents, even in the absence of statute, courts having jurisdiction over divorce generally have jurisdiction to award custody of the children of the marriage. The right to custody may also be determined in a proper case by habeas corpus (q.v.), or in some States upon application to courts of probate or similar courts having statutory jurisdiction over the subject matter. If the parents separate by agreement, no stipulation entered into by them as to the custody of the child will be enforced by the courts if prejudicial to the child.

A parent or one *in loco parentis* is entitled to the services of his child until he comes of age, and if the services are rendered to others, the parent is legally entitled to recover the reasonable value of the child's services unless payment for the services is made to the child with the consent of the parent. As between the father and the mother, the father is entitled to the child's services, but upon the death of the father or upon custody of the child being awarded to the mother, she becomes entitled to the child's services. The right of the parent to take the child's earnings may be waived by his voluntary emancipation of the child. See EMANCIPATION.

When a child having regularly rendered services to his parents continues to do so after coming of age, there is a presumption of fact that the services are rendered as a gift, and he will not be allowed to recover for the services thus rendered in the absence of some agreement to that effect.

Parents have no interest in or control over the property of their children, such control being exercised by guardians appointed by courts of chancery or probate, having jurisdiction over the property of infants. (See GUARDIAN and WARD.) Wearing apparel and personal effects, however, purchased by the parent for an infant child remain the property of the parent and subject to his control. Choses in action belonging to the infant might be enforced at common law by an action brought in the name of the infant by the parent as next friend (*prochein ami*) of the infant; and now by statute generally such actions are prosecuted in the name of the infant by a guardian *ad litem* appointed by the court, who may be but is not necessarily a parent of the litigant.

As the parent is legally entitled to the services of the child, any wrongful act of third persons interfering with this right is a tort, for which such third persons must respond in damages to the parent. Thus a parent may recover all damages suffered by him by reason of loss of services of his child because of personal injuries inflicted upon the child by the negligent conduct of third persons. And in most jurisdictions he may recover also for the medical attendance supplied to the child, although, as will appear, the parent was not bound by the common law to supply the child with necessaries.

Upon similar principles the parent may recover damages for the seduction of an infant daughter. Indeed, by the early law, as well as in some States at the present time, the parent's right to recover for the seduction was based solely upon his right to recover for the loss of his daughter's services. The courts of some States, however, have departed from this rule and permit a recovery, even though the parent has emancipated his daughter and is, therefore, not entitled to her services. See SEDUCTION.

As regards the maintenance of the child, it is somewhat singular that according to the common law the parent is under no civil legal duty whatever to support the child. This defect in the law was remedied somewhat when what is known as the 'Poor Law' was enacted by Parliament in the reign of Elizabeth by which some legal duty was imposed upon parents and children to support each other when financially able to do so, or rather to assist the parish authorities in contributing to their support.

This act authorized the parish authorities to enforce the law by appropriate proceedings, and even authorized them to procure a judicial seizure of the parents' property for the use of their children in case of abandonment of the children by the parents. But it did not create obligations such that one who supplies a destitute child with food and clothing has any legal claim against the parent. Similar statutes have been enacted in most of the United States, and in a few States the courts have indicated that the duty of a parent to maintain his child thus created may also be enforced by third persons by an action in the nature of *quasi* contract.

While the parent is not civilly liable to maintain his child, he is criminally responsible if, having undertaken to care for his child, he neglects it and, by exposure or failure to provide it with food or clothing, causes the child's injury or death. Parents have been held guilty of manslaughter and even murder when death resulted from negligent or improper care of their children. The English courts have held that a parent who in good faith neglects to provide medical attendance for his child because he did not believe in the use of medicine was not criminally responsible for his neglect. The rule of this decision was promptly corrected by an act of Parliament, and it is probably generally the law in the United States that a parent guilty of gross neglect in

not providing proper medical attendance for his child is criminally responsible.

At common law a parent is not liable for the torts of his child unless their commission is incited or authorized by the parent, in which case the rules for determining his liability are the same as in the law of agency or master and servant.

At common law the child is an heir of the parent (see DESCENT) and is also entitled to a share of the parent's estate under the various statutes of distribution (q.v.). This interest of the child in the parent's property may, however, be defeated by the parent's will, which may dispose of all his property to strangers. In several States it is provided by statute that children of a testator born after the execution of his will and of whom no mention is made in the will shall take the same share in the parent's property which he would have secured had the parent died intestate.

ILLEGITIMATE CHILDREN. In strictness of law an illegitimate child, that is, one born out of wedlock, has no parent, and consequently he has no rights as against his natural parents, and they owe him no corresponding obligation. Natural parents at common law were, therefore, not bound to support their illegitimate child, and in case of their death intestate he acquired no interest in their property as heir or next of kin. The English Poor Law or Bastardy Act, which has been substantially reënacted in most of the United States, has qualified the common-law rule as to the duty of parents to maintain their illegitimate children.

As between the father and mother of the child the English statute makes the following requirements: The father is not bound even by the poor laws to maintain the child, and the parish officers cannot institute any proceedings whatever against him for this purpose; but the mother or the guardian of the child may, to a certain extent, compel him to contribute toward the child's maintenance and education. The first step is to go before a justice of the peace and obtain a summons of affiliation. The father is then cited before the magistrate, and if the mother swears that he is the father of the child, and some material part of her statement is corroborated by a third party, the magistrate may make an order directing the father to pay the expenses of lying in and a weekly sum until the child attains the age of sixteen. The mother may make this application either a few months before the birth, or within twelve months after the birth; and even after that time, provided that she can prove that the putative father paid her some money on account of the child within the twelve months. The putative father in these cases is a competent and compellable witness. The poor laws make the mother liable to maintain the child until it attains the age of sixteen; and not only is she so bound, but any man who marries her is also by statute bound to support all her illegitimate children until they attain that age. As regards the custody of illegitimate children, the mother is the party exclusively entitled, for the father is deemed in point of law not to be related to such child. Yet, if the father has in point of fact obtained the custody of such child, and the child is taken away by fraud, the courts will restore the child to his custody, so as to put him in the same position as before.

The bastardy statutes in the United States in general differ only in minor particulars from the English statute. One important difference, however, is a provision generally adopted authorizing the poor officers or other designated officials to bring bastardy proceedings directly against the putative father without the intervention of the mother. Although the father of an illegitimate child is under no direct positive obligation to support his child, the natural relationship has been held in some States to be a sufficient consideration to support and render enforceable the father's promise or agreement with third persons to pay for the support of the child even if made after the support has been given.

In some States also illegitimate children are by statute made heirs at law of the mother. Such is the law in New York, provided the mother leave no legitimate children. The mother may also inherit from her illegitimate child.

Consult: Field, *Legal Relations of Infants, Parent and Child*, etc. (Rochester, 1888); Ewell, *Cases on Domestic Relations* (Boston, 1891); Fraser, *Treatise on the Law of Scotland Relative to Parent and Child*, etc. (2d ed., Edinburgh, 1886); Eversley, *Law of the Domestic Relations* (London, 1885); Arndts, *Juristische Encyclopädie* (9th ed., Stuttgart, 1895); and the authorities referred to under such titles as DOMESTIC RELATIONS; HUSBAND AND WIFE; MARRIAGE; CONTRACT; DIVORCE; etc.

PARENZO, pä-rĕn'dzō (Lat. *Parentium*). A town on the west coast of the Crownland of Istria, Austria, situated on a rocky peninsula, connected with the mainland by a narrow strip of land, 35 miles south by west of Trieste (Map: Austria, C 4). It is the seat of the Provincial Assembly and of a Roman Catholic bishopric, and has a good harbor. Its principal building is the cathedral, a basilica of the sixth century containing fine mosaics. There are also ruins of Roman buildings. The inhabitants are engaged principally in fishing, shipbuilding, and trade. Population, in 1900, 9962, mostly Italians. Parenzo was a Roman colony. Parentium; became a part of the Venetian Republic in 1267 and remained so until its dissolution. The bishopric of Parenzo was founded about 524 and united with that of Pola in 1827.

PARE'PA-RO'SA, EUPHROSYNE (1836-74). An English soprano. She was born at Edinburgh and was the daughter of Georgiades de Boyesen, a Wallachian nobleman, and Elizabeth Seguin. She studied under Crescentini, Panseron, and Bordogni, and made her first appearance as a singer at Malta under the name of Parepa. She made her début in London in 1857, and in 1863 married Captain Carvell, who died two years later. She then went to America, and appeared at Irving Hall, New York, in 1865. In 1867 she married Carl Rosa, the violinist and operatic manager and conductor, with whom in 1869 she organized an English opera company. She sang at the Boston Peace Jubilee in 1869, and was a member of the Italian opera company at the Khedive's Theatre in Cairo during the winter of 1872-73. Her voice was remarkable for its purity and flexibility, and had a compass of two and one-half octaves. She died in London.

PAR'ESIS (Neo-Lat., from Gk. παρεσις, letting go, paralysis, from παριέναι, *pariénai*, to relax, from παρά, *para*, beside, beyond + ἵεναι,

hiemi, to let go, send). General Paresis, Paralytic Dementia, Dementia Paralytica, General Paralysis of the Insane, popularly but improperly called 'Softening of the Brain.' "A chronic diffuse encephalitis, presenting mental, motor, vaso-motor, and sensory symptoms, with progressive course and fatal termination" (Starr).

Etiology. The disease is much more common in males than in females, and occurs especially between the ages of thirty and fifty-five. In but few cases has any hereditary tendency been noted. While in general the disease is said to be more frequent among the lower classes, in this country it is most common among the middle and upper classes. About 80 per cent. of cases give a syphilitic history, and the relation between syphilis and paresis is so intimate that Fournier classes the latter as among 'les affections parasyphilitiques.' Alcoholic and sexual excesses and severe mental or emotional strains may also be mentioned as etiological factors.

Pathology. The earlier changes consist of congestion of the vessels of the brain and pia mater, exudation of serum into the peri-vascular lymph spaces, and an increase in the nuclei and cellular elements of the walls of the vessels. Following these vascular changes, and probably in a measure dependent upon them, is an increase in the neuroglia or connective tissue of the brain. This neuroglia increase often goes on quite rapidly and determines a corresponding shrinkage and atrophy of the nervous tissue proper. As the process continues there are degenerative changes in the nerve cells and fibres, with pigmentation and the formation of cyst-like cavities. There are usually an increase of fluid in the ventricles and thickening of the ependyma. With the full development of the lesion the brain atrophies, becomes shrunken, weighs less than the normal brain, the convolutions are smaller and the sulci more widely open. These changes affect the whole brain, but are most marked in the frontal and parietal lobes. Accompanying the brain lesions there are often a chronic meningitis and sclerosis of the posterior columns of the cord. Sclerosis of the lateral columns may also occur.

Symptoms. The onset is gradual. It is first noticed by friends that the patient does not seem in his usual frame of mind. He is irritable, either depressed or excitable, is growing inattentive to business, is laying unusual plans and schemes. These are often of great magnitude and involve expense entirely out of proportion to the man's means. The patient feels well, often saying that he never felt better in his life. A marked egotism usually develops. He boasts of his wealth, power, and abilities. Soon he becomes forgetful, careless, inattentive, unable to concentrate his mind upon any definite train of thoughts or to carry on a logical argument. This becomes noticeable in his conversation, which is disconnected. Headache and sleeplessness are common and there is a marked loss in weight and in strength. Even though previously a man of exemplary habits, the patient becomes neglectful of the ordinary proprieties of life, uses bad language, ignores family obligations, loses his temper, and indulges in sexual and alcoholic excesses. This condition lasts from one to three years and passes over gradually into a fully developed dementia. This condition is marked by an increase in the symptoms above described. Egotism is usually a marked feature and delusions of grandeur are the rule. Instead of exaltation there may be depression and melancholia, or melancholia and elation may alternate. Illusions, delusions, and hallucinations are common, but there are no fixed systematic delusions as is the case in paranoia. The emotions are in a state of unstable equilibrium. The patient is easily moved to laughter or tears. Slight causes produce intense excitement, which may take the form of rage or frenzy, rendering the patient dangerous to his fellows. There is rarely any suicidal tendency. Self-control is weakened, and consequently voluntary actions are weak, irresponsible, and impulsive. Self-consciousness is impaired, the patient failing to appreciate his changed mental condition. He is contented wherever he is, is not concerned about the anxiety of his friends, loss of money or business, or even asylum confinement. Of motor symptoms tremor of the tongue and face muscles appears first. Later almost any motion is attended with trembling. This results in thickness of speech and in clumsiness in the finer coördinate movements, such as writing. These motor symptoms gradually pass over into a paralysis, which becomes increasingly widespread and increasingly complete. There is also marked increase or marked decrease in the reflexes, with less retention of urine and of control of the rectum. Sensory symptoms, anæsthesia and analgesia, are late manifestations. Bed-sores and cystitis are very common. The average duration of the disease is from three to four years. In the early stage of the disease there may be transient paralysis of one arm or one leg. There may be convulsions occurring at intervals of a few days, which may be mistaken for epilepsy. In the last stages convulsions are usual and severe. Death results from exhaustion, frequently from convulsions, or from some intercurrent complication, such as pneumonia, cystitis, or obstruction of the bowels.

Treatment. Antisyphilitic treatment may be tried in the early stages. Later the treatment is entirely symptomatic, tonic, sedative in conditions of excitement, while in the later stages confinement in an institution or constant home care is necessary. See Insanity.

PAR'ET, William (1826—). A bishop of the Protestant Episcopal Church. He was born in New York, graduated from Hobart College in 1849, and pursued his theological studies under Bishop De Lancey, by whom he was ordained priest at Grace Church, Rochester, June 28, 1853. He had charges at Clyde, N. Y.; Pierrepont Manor, N. Y.; East Saginaw, Mich., Elmira, N. Y.; Williamsport, Pa.; and Washington, D. C. He was consecrated sixth bishop of Maryland on January 8, 1885. He is the author of canonical digests, and *Saint Peter and the Primacy*, a lecture before the Church Club of New York.

PARGA, pär'gà. A town in the Vilayet of Janina, European Turkey, situated on the shore of the Ionian Sea, opposite the island of Paxos (Map: Balkan Peninsula, C 5). It is built on a steep cliff, surmounted by an almost impregnable citadel, and has a harbor defended by a small island. Parga, founded in the last days of the

Roman Empire, was independent and under the protection of Venice from 1401 to 1797, when it was for a short time governed by the French. In 1814 Ali Pasha, Governor of Albania, besieged it, and the people applied to the English for aid. England took possession of the fortress, but in 1819 handed it over to Ali Pasha, whereupon most of the inhabitants emigrated to the Ionian Islands. The present population is about 5000.

PAR'GASITE (named from *Pargas*, Sweden, where it is found). A name applied to the green and bluish-green varieties of hornblende. Pargasite is usually found in the form of stout lustrous crystals, although sometimes occurring in the granular form. It is distinguished from the common hornblende, which is usually dark-green or black in color.

PAR'GO. A fish—a snapper of the genus Neomænis. The familiar red snapper is 'pargo colorado,' called in Havana markets 'pargo guachinango,' or Mexican snapper, because brought from the Mexican coast. The silk snapper is 'pargo de lo alto.'

PARHELIA. See HALO.

PARIA, pä'rē-ä, GULF OF. An inlet of the Atlantic Ocean on the coast of Venezuela (Map: Venezuela, E 1). It is 40 miles wide and 100 miles long, and almost completely land-locked, being cut off from the Caribbean Sea by the narrow and rocky Paria Peninsula, while across its mouth lies the island of Trinidad. The gulf communicates with the ocean on either side of the island by the straits known as the Dragon's Mouth in the north and the Serpent's Mouth in the south, each about 10 miles wide. They were thus named by Columbus, who discovered them in 1498, because of the difficulties he found in navigating the strong currents which race through them. The gulf receives the northern arms of the Orinoco delta.

PARIAH, pä'rĭ-à (from Tamil *pariah*, *pariar*, drummer, from *parai*, drum; so called because they are hereditary drum-beaters). The name applied to aboriginal individuals of low class throughout Southern India, who do not belong to any of the castes of the Brahmanical system. They are shunned even by the lowest Hindus who profess Brahmanism, since the touch of a pariah renders a Brahman impure. Pariahs were formerly compelled to wear a bell to warn Brahmans of their proximity. The pariahs are of Negrito origin, as shown by their short woolly hair, flat nose, thick lips, and short stature. They, like the Hindus, are divided into distinct grades, and imitate their superiors in that the lowest pariah is as careful to preserve his status as the proudest Brahman. In the Tamil country they form a large part of the population, and are employed as agricultural laborers or as servants to Europeans. In station, however, they are superior to other aborigines.

PARIAH DOG. The native cur of Egypt, Persia, and all Oriental countries, regarded merely as an outcast and scavenger. According to Youatt, there are several varieties, viz.: (1) a wild form bred in the jungles and lower ranges of the Himalayas, of a reddish-brown color, with sharp pointed ears; (2) a form in inhabited districts among which turn-spits are often found; (3) the Sumatran form, which has the countenance of a fox, eyes oblique, ears rounded, hairy, muzzle foxy brown, tail bushy and pendulous; (4) the Javanese indigenous dog. Stonehenge describes the pariah dog as a cross between a dhole and any domesticated dog of the neighborhood, and Fitzinger calls it a variant of the sheep-dog. The pariah dogs of Egypt appear to belong to a single race, and, according to Lydekker, are about the size of a sheep-dog, but of a stouter build, with a broader head, the tail being long, generally bushy, and carried close to the ground. The general color of their coarse rough hair is reddish brown, tending in some individuals more decidedly to gray, and in others to yellow. Occasionally black or tawny individuals may be observed. Their ears are short, pointed, and usually erect.

PARIAN CHRONICLE. A marble slab containing the most important inscription among the Arundel Marbles (q.v.).

PA RIASAU'RUS (Neo-Lat., from Gk. παρεία, *pareia*, cheek + σαῦρος, *sauros*, lizard). A remarkable fossil anomodont reptile, of which a few quite complete skeletons have been found in the Permo-Triassic Karoo formation of South Africa. The animal was large, about 10 feet in length, of massive build, with very short stout limbs and a short tail. The skeleton presents a most peculiar squat appearance and in some respects suggests that of the turtles, for which reason this creature has been thought to afford a clue to the origin of the chelonians. There were a few rows of small dermal scales on the back, but no nearer approximation to the carapace of the turtles.

PARI'ETAL BONES. See SKULL.

PARIEU, pä'ryē', MARIE LOUIS PIERRE FÉLIX ESQUIROU DE (1815-93). A French politician and economist, born at Aurillac. He studied at Paris and Strassburg and practiced law at Rouen. In 1848 he was elected to the Constituent Assembly, where he voted with the Moderate Left. From 1849 till 1851 he was Minister of Public Instruction. He joined the Bonapartist Party, and became a member of the Council of State in 1852. In the Ministry of Ollivier he was president of the Council of State. He served as Senator from Cantal in 1876, but was defeated in the election of 1885. He was one of the most earnest advocates of a single gold standard in France. His chief works are: *Traité des impôts* (1862-64); *Principes de la science politique* (1870); *La politique monétaire en France et en Allemagne* (1872); and *Histoire de Gustave-Adolphe* (1875).

PARIMA, pä-rē'mä, SIERRA DE. An isolated mountain system running along the southern boundary of Venezuela and Guiana, and forming part of the divide between the Orinoco and the Amazon (Map: Brazil, E 3). Though the name Parima is commonly extended to the whole system, the eastern range is also known as the Sierra Pacaraima. It forms a vast turtle-back plateau consisting of a granite core underlying Old Sandstone strata. This plateau is crossed in various directions by short ridges, and falls, especially toward the Amazon valley, by several steep escarpments. The higher ridges are generally barren rocks, but the plains intervening between the successive escarpments are covered with grass or forests. The system is neither as high nor as sharply defined as the northern mountains of Venezuela. The highest points are Mount Maraguaca, 8230 feet, and Mount Duida,

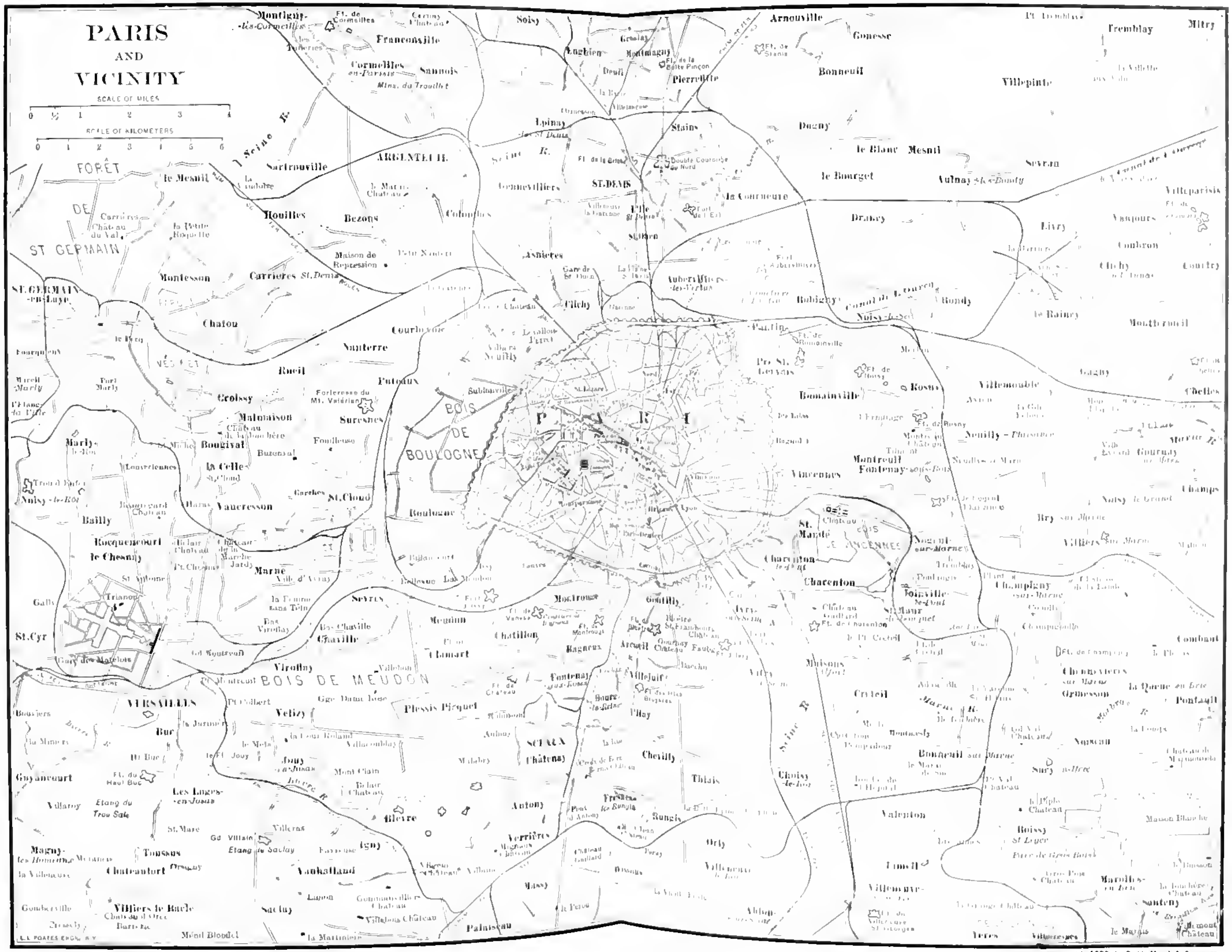
8120 feet. The latter is a conspicuous landmark, situated near the point of bifurcation of the Orinoco and the Cassiquaire.

PARINI, pä-rē'nē, Giuseppe (1729-99). An Italian poet, born at Bosio, May 23, 1729. After the appearance of his first verses he was made a member of the Accademia dei Trasformati, and he was admitted into a branch of the Arcadia. He became a priest in 1754. From 1773 on he taught the principles of fine arts at the Brera in Milan. To Bonaparte he owed a temporary office in the government of Milan. He died at Milan, August 15, 1799. His more important works are the descriptive poem *Il Giorno* and the *Odi* or Odes. The *Odi*, some twenty-one in number, were composed between 1757 and 1795, and, like most of his earlier poetry, show that he had a deal of the Arcadian spirit, although he intentionally avoided the excessive refinement and mellifluousness of the Arcadian measures. The *Giorno*, written after 1760, is not only Parini's masterpiece, but is also one of the most important literary productions of Italy in the eighteenth century. It is composed of four parts: the *Mattino* (morning), the *Meriggio* (noon), the *Vespro* (evening), and the *Notte* (night). Under the form of counsels given to a young noble as to the way in which he should spend his day, the author has here satirized the fashionable youth of his time, who were given up to effeminate and corrupt practices. Consult Reini's edition of the *Opere di Giuseppe Parini* (Milan, 1801-04), which is still the most nearly complete collection of his works, and contains his prose productions (mainly academic discourses) as well as his verse. Of the *Odi* the best edition is that of Salveraglio (Bologna, 1882). Consult also Cerquetti, *Il testo più sicuro delle Odi di Giuseppe Parini* (Osimo, 1892).

PARIS, *Fr. pron.* pà'rē'. The metropolis of France, and the capital of the Department of Seine, situated on the River Seine, 110 miles in a direct line from its mouth, latitude 48° 50′ N., longitude 2° 20′ E. With its suburbs, comprised in the arrondissements of Saint-Denis and Sceaux, Paris forms the Department of Seine (q.v.). The city lies in a hollow, about 200 feet above the level of the sea, and is surrounded by low hills, which to the north, at Belleville and Montmartre, reach a maximum altitude respectively of 330 feet and 420 feet. These hills, separated by narrow valleys or plateaus, as those of Saint-Denis to the north, Ivry to the southeast, Montrouge to the south, and Grenelle to the southwest, are encircled at a distance of from two to five miles by an outer range of heights, mostly fortified, which include Mont Valérien, 450 feet above the Seine, the highest point in the immediate vicinity of the city, Villejuif, Meudon, and Saint-Cloud. The hollow is a small level plain of Tertiary formation, known as the Paris Basin, composed at varying depths of different strata of gypsum and marls abounding in fossil remains, siliceous limestones, and a vast chalk bed. The strata provide in part the city's building material, stone, gravel, etc. The climate is fairly uniform and mild, pleasant and healthful, the mean annual temperature being 51° F., the mean January temperature 36°, July 66°. The river seldom freezes. Rain falls on an average during 143 days in a year, the average quantity during that period being 19.68 inches.

Paris is encircled by a wall 21 miles long, fortified by 94 bastions, pierced by 57 gates, and having a glacis and moat 48 feet wide. In addition there are 17 detached forts within a distance of two miles, and 19 outlying fortresses encircling an area of 400 square miles. The modern enceinte was constructed by Louis Philippe in 1841-44, but the outlying fortresses were added after the war of 1870. The city is now practically impregnable. Steam and electric railroads give access to the numerous suburbs famous alike for their picturesque situations and historical associations. These include the more immediate suburbs of Boulogne, with the famous Bois de Boulogne (bordering Paris on the west), adjoining which is the race-course of Longchamps, Neuilly, Levallois-Perret, Clichy-la-Garenne, Suresnes, Puteaux, Courbevoie, Asnières, Aubervilliers, Bobigny, Pantin, Pré-Saint-Gervais, Vincennes, with its wood, fort, château, and race-course, Charenton, Ivry, Gentilly, Arcueil, Bagneux, Châtillon, Montrouge, Vanves, Issy, Meudon, and the more distant Versailles, with its palace, gardens, fountains, art collections, and the Grand and Petit Trianon; Rambouillet, with its castle, parks, and gardens; Saint-Cloud, with its palace and park; Saint-Germain-en-Laye, with its two castles; Sèvres, famous for its porcelain factories; Saint-Denis, with its abbey cathedral, where the kings of France are buried; Enghien, noted for its sulphur springs, on a wooded lake near the forest of Montmorency; Argenteuil, a favorite boating resort; Mériel, which derives its celebrity from the neighboring Abbaye du Val, a twelfth-century monastic edifice of great archæological interest; Dampierre, with the splendid ducal château of the Luynes family; Fontainebleau, with its palace, fine art collections, and its extensive forest with Barbison, the resort of artists on the western border; Malmaison, with the former château residence of the Empress Josephine; and Marly-le-Roi, with its forest and aqueduct.

Communications and Bridges. The wall-girt city covers an area of about 30 square miles. It is entered by six lines of railroads; the palatial stations in the metropolis include the Gare du Nord on the Place Roubaix, the Gare Saint-Lazare, facing the Rue Saint-Lazare, the Gare de l'Est or de Strasbourg on the Place de Strasbourg, the Gare d'Orléans on the Quai d'Austerlitz, and the Gare de Lyon on the Boulevard Diderot. The Seine, which enters Paris in the southeast at Bercy, about a mile below its junction with the Marne, is spanned by 32 bridges. It leaves the city at Point du Jour in the southwest, having divided it in two parts, and having formed the two islands of La Cité and Saint-Louis, which are both covered with buildings. The river at Paris is from 300 to 500 feet wide. The most celebrated and ancient of the bridges are the Pont Notre Dame, dating from 1500, and the Pont Neuf, begun in 1578, completed by Henry IV. in 1604, and thoroughly restored in 1852. The latter, which crosses the Seine at the lower end of the Ile-de-la-Cité, is 1080 feet long, and abuts near the middle on a small peninsula planted with trees which form a background to the equestrian statue of Henry IV., which stands in the central open space on the bridge. Among the other bridges, the handsomest are the Pont de la Concorde, 160 yards long, built in 1781-90; the Pont d'Austerlitz, and Pont



d'Iéna, both of the time of the First Empire; the Pont du Carrousel, built under Louis Philippe; and the Pont des Invalides, Pont de l'Alma, and Pont de Solférino—all fine structures, adorned with military and naval trophies commemorative of events and victories connected with the Second Empire. Among the most recent, and one of the most striking, is the Pont Alexandre III., named in honor of the Czar, and the Pont Mirabeau, connecting Auteuil and Grenelle. These bridges all communicate directly with the spacious quays, planted with trees, which line both banks of the Seine, and which, together with the boulevards, give characteristic beauty to the city. Although the most ancient quays—as the Quai des Augustins and the Quai de la Mégisserie—date from the fourteenth century, the greatest part of these magnificent embankments, measuring 12 miles in extent, is due to Napoleon I. and Napoleon III.

STREETS, BUILDINGS, MONUMENTS, ETC. The private houses, most of which are of the apartment or flat-house order, rising to six or seven stories, as well as the public buildings, are built of a light-colored limestone, easily wrought and carved ornamentally. Among the finest of the wide and straight streets are the Rue de Rivoli, two miles in length, the Rue de la Paix, the Rue du Faubourg Saint-Honoré, and the Rue Royale. The boulevards, which extend in an irregularly circular line on both sides of the Seine, generally on the site of the ancient ramparts, between the nucleus of the city and its surrounding quarters, present the most striking feature of Parisian life. In all the better parts of the city they are lined with trees, seats, and little towers called Vespasiennes, covered with advertisements. Restaurants, cafés, shops, and various places of amusement succeed one another for miles, their character varying from the height of luxury and elegance in the Boulevard des Italiens and the Boulevard Haussmann, to the domestic simplicity of the Boulevards Beaumarchais and Saint-Denis. Among the public squares or places, of which there are over 130, mostly owned by the municipality, the most noteworthy is the Place de la Concorde, which connects the gardens of the Tuileries (q.v.) with the Champs Elysées (q.v.), and embraces a magnificent view of some of the finest buildings and gardens of Paris. In the centre is the famous obelisk of Luxor, brought from Egypt to France in 1836, and covered over its entire height of 76 feet with hieroglyphics. On the site of this obelisk stood the Revolutionary guillotine, at which perished Louis XVI., Marie Antoinette, Philippe Egalité, Danton, Robespierre, and a host of other victims. Of the other squares, the following are some of the handsomest: the Place du Carrousel, west of the Louvre, with the Arc de Triomphe du Carrousel, erected by Napoleon I. in commemoration of his victories in the campaigns of 1805-06; the Place de la République, with a fine bronze statue of the Republic; the Place de l'Opéra; the Place Vendôme, with Napoleon's column of victory; the Place de la Bastille, where once stood that famous prison and fortress (see BASTILLE); the Place de la Nation, formerly Place du Trône (with its fine fountain and monumental group, the Triumph of the Republic); the Place de l'Hôtel de Ville, formerly Place de la Grève, for many ages the scene of public executions, and the spot at which some of the bloodiest deeds of the Revolution were perpetrated. The Porte Saint-Martin and Porte Saint-Denis, which were erected by Louis XIV. to commemorate his victories in the Low Countries, and are adorned with bas-reliefs representing events of these campaigns, mark the ancient limits of the most turbulent quarters of the Paris of the past; the Arc de Triomphe de l'Etoile, 160 feet high and 146 feet wide, begun by Napoleon I. in 1806, and completed in 1836 at a cost of more than $2,000,000, may be said to form the extreme west end boundary of the aristocratic quarters. It is profusely adorned with bas-reliefs and alto-reliefs, representing victories of Napoleon. The great streets which radiate from the Arc de Triomphe de l'Etoile are among the most magnificent of Paris, and form the finest quarter. The Place de l'Etoile is connected with the Champs Elysées by the Avenue des Champs Elysées, with the celebrated Bois de Boulogne (q.v.) by the Avenues Grande Armée, Bois de Boulogne, and Victor Hugo, and the Portes Neuilly, Dauphiné, and Maillot; and it communicates by the Avenues Kléber and d'Iéna with the Place, the Parc, and the Palais du Trocadéro.

The Palais du Trocadéro, named after a Cadiz fort taken in 1823 by the French, dates from the exhibition of 1878; it is a mammoth building of Oriental architecture and crescent form, on an elevation surmounting a huge cascade of ornamental water. It has valuable museums of comparative sculpture and of ethnography, and its fine salle des Fêtes, containing a huge organ, can accommodate 6000 persons. In the well-kept park is a subterranean aquarium. The Pont d'Iéna leads from the Parc across the Seine to the historic Champ de Mars (q.v.), the site of the universal expositions since 1867, and of the Eiffel Tower (q.v.), 984 feet high, built for the Exposition of 1889. On the southeast is the Ecole Militaire, founded in 1752 and formerly used as barracks for infantry and cavalry, but now occupied by the Ecole Supérieure de Guerre. Near by is the Hôtel des Invalides (q.v.), founded in 1670 for disabled soldiers. The crypt of the church contains the sarcophagus, hewn from a huge block of Russian granite, in which lie the remains of Napoleon I., deposited there in 1840. The Musée d'Artillerie in the west wing comprises an historical collection of 10,000 war implements. The fine Esplanade des Invalides, fronting the building and bordered by the Quai d'Orsay, connects by the Pont Alexandre III. with the Champs Elysées on the north bank. Here are situated the Palais de l'Elysée, the official residence of the President of the Republic, the Grand and Petit Palais des Beaux Arts, where the Salons are held, and the Palais de Glace, the three latter built for the Exposition of 1900, having replaced the Palais de l'Industrie built for the first Great Exposition in 1855, and until 1897 housing a permanent exhibition. Thence through the Place de la Concorde the Jardin des Tuileries is reached, to the east of which is the Louvre (q.v.), forming a square of 576 by 538 feet, remarkable especially the eastern façade, for its architectural beauty.

The Louvre, formerly a royal residence, was connected with the celebrated palace of the Tuileries (q.v.) by a great picture gallery, and between the two palaces lay the Place du Carrousel. Napoleon III. further connected the Tuileries and Louvre on the northern side, throw-

ing them into one vast building, which formed the most palatial structure in the world. The Tuileries continued to be occupied as the residence of the Imperial family; but the Louvre proper, with its series of great galleries, formed a vast museum of pictures, sculptures, and collections of Egyptian, Greek, and Roman antiquities. The Communists of 1871 attempted to burn the whole pile and succeeded in destroying the Tuileries and a corner of the Louvre. The library of the Louvre, with its contents, was burned, but the rest of the building and its priceless treasures were saved. North of the Louvre is the Palais Royal (q.v.), and north of the Palais Royal is the Bourse or Exchange, a beautiful structure in Graeco-Roman style, surrounded by sixty-six Corinthian columns; to the east, on the north bank of the Seine, opposite the Ile de la Cité, is the Hôtel de Ville. Since 1871, when it was burned by the Communists, it has been carefully rebuilt in the style of its predecessor, and is one of the most magnificent buildings in Paris. It is the residence of the prefect of the Seine, and includes all the offices for the transaction of the municipal business of Paris. Not far from the Hôtel de Ville is the Tour Saint Jacques, a square Gothic tower 175 feet high, dating from 1504-22, and until recently utilized as an atmospherical observatory; it affords one of the finest views in Paris. Almost opposite, on the northern bank of the Cité, stands the vast Palais de Justice, originally the residence of the kings of France; some parts of it date from the fourteenth century, others are modern. It is the seat of some of the courts of law, as the Court of Cassation, the tribunals of the first appeal, and of police. Within the precincts of this palace are the Sainte Chapelle, and the noted old prison of the Conciergerie, in which Marie Antoinette, Danton, and Robespierre were successively confined. The Conciergerie, in which prisoners are lodged pending their trial, constituted one of the eight prisons of Paris, of which the principal were La Force, Saint Pélagie, Saint Lazare, Mazas, and La Roquette. The latter have been replaced by the modern prison of Fresnes-les-Rungis, which covers fifty acres, the Conciergerie alone being retained.

Among other notable features on the north of the river are the mammoth Halles Centrales or Central Markets, the Marché du Temple, and the Parc des Buttes Chaumont. The palace of the Luxembourg (q.v.), on the south side of the Seine, was built in the Florentine style by Jacques Debrosse for Marie de' Medici. It contains many magnificent rooms and the celebrated museum devoted to the exhibition of the works of modern artists and other notable features. Also on the south side of the river are the Sorbonne (q.v.), the centre of the famous Latin Quarter, the Panthéon (q.v.), the Jardin des Plantes, the large Halle aux Vins, the Hospice de la Salpêtrière, the Observatory, and the Cemetery of Mont Parnasse.

Paris has many theatres and places of amusement, suited to the tastes and means of every class. The leading houses, as the Opéra, Théâtre Français—chiefly devoted to classical French drama—Odéon, Théâtre Italien, etc., receive a subvention from the Government, and all are under strict police supervision. The new opera house, completed in 1875, is a magnificent building, costing, exclusive of the site, $5,600,000. It is at present the largest theatre in the world, occupying an area of nearly three acres; its most striking features are the magnificent Grand Staircase and the Foyer with admirable decorations. Cheap concerts, equestrian performances, and public balls, held in the open air in summer, supply a constant round of gayety to the burgher and working classes at a moderate cost, and form a characteristic feature of Parisian life.

Among the large number of churches, the grandest and most interesting from an historic point of view is the Cathedral of Notre Dame (q.v.), which stands on a site on the Ile de la Cité, successively occupied by a Pagan temple and a Christian basilica of the time of the Merovingian kings. The present building was constructed between 1163 and the end of the thirteenth century; since then it has been frequently altered, and in its present state of restored magnificence ranks as one of the noblest specimens of Gothic architecture. Saint Germain-des-Près, which is probably the most ancient church in Paris, was completed in 1163; Saint Etienne du Mont and Saint Germain l'Auxerrois, both ancient, are interesting—the former for its picturesque and quaint decorations, and for containing the tomb of Saint Geneviève, the patron saint of Paris; and the latter for its rich decorations and the frescoed portal, restored at the wish of Margaret of Valois, and for the fact that from its little bell-tower the signal was given for the massacre of the Huguenots on Saint Bartholomew's night. The Sainte Chapelle, built by Saint Louis in 1245-48 for the reception of the various relics which he had brought from the Holy Land, is one of the most remarkable buildings in Paris, profusely decorated in all parts with brilliantly colored materials. In Saint Eustache, erected 1532-1637, the Feast of Reason was celebrated in 1793; here is performed probably the finest religious music in Paris. Saint Sulpice, finished in 1749, is noticeable for its size, measuring 462 feet in length, 183 feet in width, and 108 feet in height. Among modern churches are: the Madeleine (q.v.), built in imitation of a Greek temple, and surrounded by a colonnade of fifty-four massive Corinthian columns; the building having no windows, the light enters through the ceiling of the three cupolas surmounting it; the interior is gorgeous with gildings, frescoes, carvings, marbles, and statues; the Panthéon (q.v.), which was begun as a church, but converted by the Constituent Assembly at the time of the Revolution into a temple dedicated to the great men of the nation, was restored to the Church by Napoleon III, and rededicated to Saint Geneviève, but was definitely secularized in 1885, when Victor Hugo was buried there; Notre Dame de Lorette, erected in 1823, a flagrant specimen of the meretricious taste of the day; Saint Vincent de Paul, completed in 1844, somewhat more imposing in style; and, crowning the height of Montmartre, the national votive church of the Sacré Cœur, begun in 1875, a Romanesque edifice with a Byzantine dome and campanile respectively 197 feet and 263 feet high. Among the Protestant churches, L'Oratoire is the largest and the best known.

Paris has a number of cemeteries, of which the principal one is Père Lachaise, extending over 110 acres, and filled in every part with monuments erected to the memory of the multi-

tude of celebrated persons who have been buried here. The Morgue, on the Ile de la Cité, behind the Cathedral of Notre Dame, is a building in which the bodies of unknown persons who have met with a violent death are placed. These, if not claimed within three days, are buried at the public expense. The southern parts of the city are built over beds of limestone, rich in fossils, which have been so extensively quarried as to have become a mere network of vast caverns, which in some cases scarcely afford sufficient support to the houses above. These quarries were converted into catacombs in 1784, and there are deposited the bones of the dead collected from the ancient cemeteries of Paris.

EDUCATIONAL INSTITUTIONS. The chief institutions connected with the University of France are situated in the Quartier Latin. The old Sorbonne (q.v.), a large building erected by Cardinal Richelieu for the faculties of the old University of Paris, has been replaced by a magnificent modern building, with fine lecture halls and class-rooms, and an extensive library open to the public. Near the Sorbonne is the Collège de France, where gratuitous public lectures are also delivered by eminent scholars and men of letters. The Ecole Polytechnique, the School of Medicine and the School of Law, the Observatory, and the Jardin des Plantes, with its great museum of natural history, lecture-rooms, and botanical and zoölogical gardens, are situated in the same quarter of Paris.

The principal of the public libraries is that of the Rue Richelieu, now called the Bibliothèque Nationale, which contains more than 2,600,000 volumes, 100,000 manuscripts, many portfolios or engravings, and a collection of 400,000 coins and medals, which originated in a small collection of books placed by Louis XI. in the Louvre. In addition, the municipality maintains many branch libraries. No city is richer than Paris in fine-art collections, and among these the museums at the Louvre stand preëminent. The Palais or Ecole des Beaux-Arts, one of the finest educational institutions in the world, dating from 1648, is a place for exhibiting art, manufactures, and architectural models. The Hôtel Cluny, connected underground with the Roman Palais des Thermes, besides being in itself a most interesting monument of mediæval art, contains curious relics of the arts and usages of the French people from the earlier ages of their history to the Renaissance period. The mint deserves notice for the perfection of its machinery. The Gobelins, or tapestry manufactory, may be included under the fine arts, as the productions of its looms are all manual and demand great artistic skill. The Conservatoire des Arts et Métiers, in the Rue Saint Martin, contains a great collection of models of machinery and class-rooms for the instruction of workmen in all departments of applied science. The spacious building in which the exposition of 1878 took place was named the Palace of the Trocadéro, and now forms a permanent exhibition. Among the numerous learned societies, associations, and institutions the chief are the Académie de Médecine and the Institute of France (q.v.), the latter housed in the Palais de l'Institut on the Seine at the end of the Pont des Arts, and comprising five academies devoted respectively to the supervision of the French language and the publication of official dictionaries of the French language (the French Academy), to archæology and ancient languages; to mathematics and natural science; to painting, architecture, sculpture, and music; and to philosophy, history, and political economy.

ADMINISTRATION. Paris is divided into twenty arrondissements for purposes of administration. The Prefect of the Seine is the chief of the municipal government, and is appointed by the national Government. There is a municipal council, composed of eighty members, four from each arrondissement, chosen by popular election. Each arrondissement has a mayor and two assistant councilors. The arrondissement is the unit of municipal organization for all administrative purposes. It registers all the births and deaths within its boundaries; keeps the registration lists of voters and jurors; attends to the assessment and collection of all taxes; receives application for licenses and privileges; serves as an agency in floating municipal or State loans; administers the schools and libraries; and forms the local centre for all modes of charity work. The whole work of the municipal administrative machine is greatly facilitated by the admirable system of civil service regulating all the appointments and promotions of city officials. The prefect of police is at the head of the civic guard or gendarmes, the fire brigade, and the gardiens de la paix, or city police, who are armed with swords. The number of policemen has been constantly increasing. At the close of the last century there were nearly 9000 men on the police force, or 35 to 10,000 population.

Paris is abundantly supplied with water, the chief sources being the Seine, the Canal d'Ourcq, the Marne, the Dhuis, and a vast natural reservoir, underlying the Paris Basin; the latter is tapped by artesian wells, the most famous of which is the well of Grenelle, 1800 feet deep, and surmounted by a tower 108 feet high. The cleaning, sewerage, and water supplies are under the charge of the prefect. The sewerage system is admirable; the total length of the underground channels is over 615 miles, and they are kept so clean and well ventilated that an hour's excursion through the sewers or *égouts* is one of the ordinary experiences of visitors to Paris, the journey being made partly in boats and partly by electric trolleys. Paris has a sewage farm, five miles from the city limits (in the Saint Germain forest), which has proved a success from an agricultural point of view, without in the least injuring the health of the community in that region. The paving of the city leaves nothing to be desired, and the street lighting is admirably carried out by means of electric and gas lights furnished by private companies, as explained below.

The administrative tendency in Paris is for municipal ownership of all works supplying public wants and directly affecting public health.

The Conseil d'Hygiène et de Salubrité, or Board of Health, is composed of men known for their high attainments in science, and includes physicians, city engineers, and men whose technical training enables them best to deal with sanitary problems. Within the scope of its work come not only cases of disease and epidemics, but the sanitary regulation of workshops, schools, and dwellings; prevention of adulteration of food; sanitary aspects of the water-supply, drainage, and cemetery management. In addition to that

central body there are twenty 'commissions d'hygiène,' one for each arrondissement, and a 'commission des logements insalubres,' composed of physicians, architects, and engineers, whose duty it is to pass upon the sanitary conditions of dwellings; they can recommend sanitary improvements or condemnation of houses, and their recommendations are as a rule favorably acted upon by the municipal council. There is a special service of sanitary police which enforces all the health laws.

In addition to the activities enumerated above, the municipality owns all markets, cattle-yards, and slaughter-houses, from which it derives a considerable income. The municipal markets and abattoirs facilitate the inspection of the meat supply, and the municipal laboratory has done a great deal in checking adulteration of milk, bread, wine, and other food of common use, and has served greatly to reduce the death rate.

The poor relief is organized in Paris on a large scale and centralized in the hands of a special department called 'L'Assistance Publique à Paris.' This has charge of the hospitals, of the homes and asylums for aged poor, as well as for friendless children, and of outdoor relief. The department is under the authority of the Prefect and is governed by a director and a board, composed of leading men from various Government departments. The work is carried out in detail by the 'Bureaux de bienfaisance,' one in each arrondissement, and composed of persons familiar with the people in their respective districts. The city comes to the aid of the poor in several other ways. There are a number of municipal lodging-houses open to unemployed workmen free of charge, and furnishing a meal to each guest. A similar home exists for working women. From 15,000 to 20,000 families are helped each year by advance of rent-money in cases of threatened eviction. An agricultural colony has been established not far from the city for those unable to make a living. A free employment office is maintained by the city in each arrondissement, and a central labor exchange known as the 'Bourse du Travail' was erected by the municipality in 1892 at a cost of 2,000,000 francs. In addition, the municipal council votes 50,000 francs annually for the maintenance of the institution, which serves as the headquarters of all the trade-unions in the city. A public pawn-shop, known as the Mont-de-Piété, has been in existence for more than a century. It advances loans in any amount at 6 per cent., which is a great accommodation for the poor. The largest of the numerous hospitals or almshouses is La Salpétrière (for women), probably the largest asylum in the world, extending over 78 acres of land; 1300 of its 4500 inmates are insane. Bicêtre, with nearly 3600 beds, receives only men. The Hospice des Enfants Trouvés, or foundling hospital, provides for the infants brought to it till they reach the age of maturity, and only demands payment in the event of a child being reclaimed. The crèches, or public nurseries, first established in 1844, of which there are now 18, receive the infants of poor women for the day at the cost of 20 centimes. Besides institutions for the blind, deaf and dumb, convalescents, sick children, etc., Paris has 17 general and special hospitals. Of these the oldest and most noted are the Hôtel Dieu, rebuilt at a cost of $9,000,000, which covered also the cost of the new site, La Charité, and La Pitié.

Education. The educational facilities of Paris are very complete. A system of kindergartens called Ecoles Maternelles is provided for children between the ages of three and six, and although attendance there is not compulsory, they are all patronized, as they are a great help to the poor. The attendance is from 50,000 to 60,000. Next follow the Ecoles Enfantiles, which are a transition from the kindergarten to the primary school, and are open to children between six and eight. The primary schools for children below the age of fourteen employ nearly 3000 teachers, half men and half women, and are attended by 156,000 pupils. The school system is under the joint supervision of the municipal council, the prefectoral administration, and the national Ministry of Education. The children are supplied with text-books, etc., and those unable to pay (60 per cent. of the total number) are given gratis one meal each day. A new feature of the school system is the boarding-school for children of widowers or guardians unable to give proper care to their children. The cost of boarding and clothing a child has been fixed at 600 francs a year, but since 1892 the payment has been reduced to 120 francs for those unable to pay more, the city paying the rest. Upon the completion of the primary school a child is free to enter a high school or professional school, according to the profession he or she chooses.

Finance. The maintenance of so many institutions involves, naturally, a great annual expense, and their municipalization has required the contraction of large loans. The budget of Paris for 1901 amounted to 314,000,000 francs, of which more than a third, 113,000,000, went for payments on the public debt. It should be observed that only about 30,000,000 francs out of these 113,000,000 go to pay off the principal, the rest being interest charges. The next heaviest item is 35,000,000 francs for the police, to which the national Government adds another 10,000,000. The other items of importance are charity, 28,000,000 francs; education, 27,000,000; streets, 24,000,000. The relative expense for the various departments is about the same from year to year. The total debt of the city is about 2,000,000,000 francs ($400,000,000). To offset these items of expense there are a number of sources of income which the city derives from the various companies holding franchises. Paris does not own its water works, nor the gas and electric plants, and has no municipal transit system. The gas company, in addition to furnishing gas for the illumination of the streets and public buildings at cost price, pays 200,000 francs a year for the right to lay its pipes and a tax of 2 francs for every 100 cubic meters of gas it sells, and divides with the city all its profits above 13½ per cent. on its capital stock, which it is not allowed to increase. This makes the total income of the city from the gas company alone equal to 20,000,000 francs. A similar arrangement with the electric lighting and water companies brings several more millions a year into the city treasury. Likewise the markets, abattoirs, and cemeteries make their contributions.

Transportation. The main means of intramural communication is supplied by the omni-

buses and electric tramways, which latter are in a great measure supplanting the former, and so satisfactorily that it seems hardly possible that until the last decade of the nineteenth century the intramural transportation was extremely inefficient. Of the comprehensive system of underground electric railways authorized by the national Government in 1898, to be built by the city and worked on lease by a private company, seven miles were in operation in 1900. One of the lines supplements the old surface steam belt railway that passes around the city just inside the fortifications. The cab service in Paris is unexcelled. The steamboats on the Seine are well patronized in pleasant weather, and it will probably be long before the ancient and familiar omnibuses are entirely put out of commission.

Industry and Trade. Paris is the largest industrial centre of France. It has a world-wide renown for the elegance and taste of its products. There are comparatively few large industrial undertakings, Paris being more of a centre of small workshops employing highly skilled laborers. Of late, however, a tendency has been noticed toward large establishments. Large factories are found in such industries as the manufacture of machinery, railroad supplies, chemical products, soap, dyes, brewing and liquor establishments, china, porcelain, leather, printing, etc. Small workshops, however, predominate in the production of clothing, gold and silver articles, furniture, optical and surgical instruments, toys, paper boxes, steel and aluminum articles, artificial flowers, perfumes, articles of luxury, gloves, etc. In all these products Paris excels the world. The book-publishing business of France is almost wholly concentrated in Paris. As a trading centre Paris stands at the head of the list of French cities. The products of its industry are valued at more than 3,000,000,000 francs annually, most of which is exported. It was among the first cities of the world to introduce large department stores such as the Louvre, the Bon Marché, and Printemps. The most important financial institutions are the Banque de France, the Crédit Foncier, the Crédit Lyonnais with 22 branches in the city, and the Clearing House, called 'Chambre de Compensation de Banquiers.' Then there is the Bourse de Commerce in addition to the Bourse de Travail.

Population. The population of Paris varied little from the thirteenth to the sixteenth century, ranging during that period from 216,000 to 260,000. In 1718 it had increased to 509,000; in 1817 to 714,000; in 1851 to 1,053,000; in 1881 to 2,269,000; while in 1891 it was 2,448,000, and in 1901, 2,714,068. The most densely populated quarters are the Eighteenth Arrondissement, formerly the Butte Montmartre, the Eleventh Arrondissement, formerly Popincourt, and the Seventeenth Arrondissement, formerly the Batignolles Monceaux. The average density of population in Paris exceeds 83,000 people to the square mile, or nearly two and one half times that of London. About 10 per cent. of the population is composed of foreigners. The great bulk of the population is Roman Catholic; there are about 60,000 Protestants and 25,000 Jews.

History. The earliest notice of Paris occurs in Julius Cæsar's *Commentaries*, in which it is described, under the name of Lutetia, as a collection of mud huts, composing the chief settlement of the Parisii, a Gallic tribe conquered by the Romans. The ruins of the Palatium Thermarum (Palais des Thermes), and of ancient altars, aqueducts, and other buildings, show that in Roman times the town extended to both banks of the Seine. Christianity was introduced about A.D. 250 by Saint Denis. In the fourth century Lutetia began to be known as Parisia, or Paris. In the sixth century Paris was chosen by Clovis as the seat of government; and after having fallen into decay under the Carlovingian kings, in whose time it suffered severely from frequent invasions of the Northmen, it finally became in the tenth century the residence of Hugh Capet, the founder of the Capetian dynasty, and the capital of the French monarchy. From this period Paris continued rapidly to increase, and in two centuries it had doubled in size and population. In the Middle Ages Paris was divided into three distinct parts—La Cité, on the islands; the Ville, on the right bank; and the Quartier Latin, or University, on the left bank of the river. Louis VI. did much to enlarge Paris, and to efface the disastrous results of its hostile occupation by the English during the wars under Henry V. and Henry VI. of England. Its progress was again checked during the wars of the last of the Valois, when the city sustained several sieges. On the accession of Henry of Navarre in 1589, a new era was opened for Paris. The improvements commenced under his reign were continued during the minority of his son, Louis XIII. Louis XIV. converted the old ramparts into public walks or boulevards, organized a regular system of police, established drainage and sewerage works, founded hospitals, almshouses, public schools, scientific societies, and a library, and thus gave to Paris a claim to be regarded as the focus of European civilization. The terrible days of the Revolution (see French Revolution) caused a temporary reaction. The improvement of Paris was commenced on a new and grander scale under the first Napoleon, when new quays, bridges, markets, streets, squares, and public gardens were created. All the treasures of art and science which conquest placed in his power were applied to the embellishment of Paris, in the restoration of which he spent more than $10,000,000 in twelve years. His downfall again arrested progress, and in many respects Paris fell behind other European cities.

Renovation of various sorts was recommenced under Louis Philippe, under whom fortifications on a colossal scale were constructed, but it was reserved for Napoleon III. to render Paris the most commodious, splendid, and beautiful of modern cities. When he commenced his improvements Paris still consisted, in the main, of a labyrinth of narrow, dark, and ill-ventilated streets. With the assistance of Baron Haussmann, the Prefect of the Seine, his schemes were carried out with rare energy and good taste. Two straight and wide thoroughfares, parallel to and near each other, were made to traverse the whole width of Paris from north to south crossing the City; a still greater thoroughfare was made to run the whole length of the town, north of the Seine, from east to west. The old boulevards were completed so as to form outer and inner circles of spacious streets, the former chiefly lying along the outskirts of the old city, the latter passing through and connecting a long line of distant suburbs. In the year 1867, when the international exhibition was opened, Paris and

becoming in all respects the most splendid city in Europe, and in that year it was visited by upward of 1,500,000 foreigners. Many further improvements were contemplated, but financial and political difficulties supervened (see FRANCE), and these great schemes had to be postponed. The siege of Paris by the Germans, which lasted from September 19, 1870, to January 28, 1871, caused much less injury to the city than the vandalism of the Red Republicans, who rose against the Government in March, 1871, took possession of Paris, and proclaimed the Commune (q.v.) the only lawful Government. Acts of pillage and wanton destruction followed. The column erected to the memory of Napoleon and the Great Army, in the Place Vendôme, one of the principal squares of Paris, was pulled down as 'a monument of tyranny.' When the Government troops under Marshal MacMahon pressed forward into the city, in the latter part of May, the Communists began systematically to set fire with petroleum to a great number of the chief buildings of Paris, public and private. The fire for a time threatened to destroy the whole city. It was not checked until property had been lost to the value of many millions of dollars and historical monuments were destroyed which never can be replaced. Two years later, however, all the private houses burned had been rebuilt, the monuments only partially injured had been restored, and the streets and public places were as splendid and gay as in the best days of the Empire. The Universal Expositions of 1878, 1889, and 1900 are among the chief events of the subsequent history of Paris.

BIBLIOGRAPHY. Du Camp, *Paris, ses organes, ses fonctions et sa vie* (8th ed., Paris, 1893); Franklin, *Les anciens plans de Paris, notices historiques et topographiques* (ib., 1880); Block and Pontich, *Administration de la ville de Paris* (ib., 1884); Colin, *Paris, sa topographie, son hygiène, ses maladies* (ib., 1885); Bournon, *Paris, histoire, monuments, administration* (ib., 1887); Hamerton, *Paris in Old and Present Times* (London, 1884); Hare, *Paris* (London, 1887); Piton, *Comment Paris s'est transformé, histoire, topographie* (Paris, 1891); Bougard, *La vie de Paris* (ib., 1891); De Amicis, *Studies of Paris*, trans. by Cady (New York, 1892); Schmidt, *Paris* (Paris, 1900); Riat, *Paris, Geschichte seiner Kunstdenkmäler* (Leipzig, 1900); Rolfo, *Plan pittoresque de la ville de Paris* (ib., 1900); *Encyclopédie municipale de la ville de Paris* (Paris, 1902); *Annuaire statistique de la ville de Paris*; also the guide books of Joanne, Baedeker, Julius Meyer, Grieben, and Murray. Consult, also, Lacombe, *Bibliographie parisienne* (Paris, 1886).

HISTORY. *Histoire générale de la ville de Paris*, published by the municipality (Paris, 1866 et seq.); Lebeuf, *Histoire de la ville et de tout le diocèse de Paris*, edited and supplemented by Cocheris (ib., 1863-83); Dulaure, *Histoire physique, civile et morale de Paris*, 7th ed., supplemented by Leynadier (ib., 1862) and by Roquette (ib., 1875 et seq.); Berty, *Topographie historique du vieux Paris* (ib., 1866-87); Ménorval, *Paris depuis ses origines jusqu'à nos jours* (ib., 1889-97); Lefeuve, *Les anciennes maisons de Paris* (5th ed., ib., 1875); Lendtre, *Les quartiers de Paris pendant la revolution, 1789-1894* (ib., 1896); Aulard, *Collection de documents relatifs à l'histoire de Paris pendant la révolution française* (ib., 1889 et seq.); La Gournerie, *Histoire de Paris et de ses monuments* (Tours, 1890); Sempronius, *Histoire de la commune de Paris* (Paris, 1871); Moriac, *Paris sous la commune* (2d ed., ib., 1871); Morin, *Histoire critique de la commune* (ib., 1871); Viollet-le-Duc, *Mémoire sur la défense de Paris* (ib., 1872); Sarcey, *Le siège de Paris* (3d ed., ib., 1872); Vidieu, *Histoire de la commune de Paris en 1871* (ib., 1880); Du Camp, *Les convulsions de Paris* (7th ed., ib., 1889); Lehauteourt, *Le siège de Paris* (ib., 1898); Simond, *Paris de 1800 à 1900* (ib., 1902); and Tourneux, *Bibliographie de l'histoire de Paris pendant la révolution française* (ib., 1890-94).

PAR'IS. A city and the county-seat of Edgar County, Ill., 20 miles northwest of Terre Haute, Ind.; on the Cleveland, Cincinnati, Chicago and Saint Louis and the Vandalia Line railroads (Map: Illinois, E 4). It is mainly a residential place, and has a public park of 100 acres, 70 of which are now submerged, forming an artificial lake. The city is in a farming district, the products of which form the staples of a considerable trade. There are extensive manufactures of brooms. Paris was laid out in 1825 and incorporated first in 1849. The government is administered under a general law of 1872, which provides for a mayor, chosen biennially, and a council. The municipality owns and operates the water-works and electric light plant. Population, in 1890, 4996; in 1900, 6105.

PARIS. A city and the county-seat of Bourbon County, Ky., 90 miles east of Louisville; on Stoner Fork of the Licking River, and at the junction of divisions of the Louisville and Nashville Railroad (Map: Kentucky, G 2). A handsome court-house, to cost more than $150,000, is in course of construction (1903), and a new library (Carnegie) is projected. Situated in the famous 'blue-grass region' of Kentucky, Paris is engaged extensively in breeding fine horses. It has also a large trade in whisky, tobacco, hemp, grass seed, etc. The gas-works are owned by the municipality. Paris was settled in 1784 and was chartered as a city in 1862. Population, in 1890, 4218; in 1900, 4603.

PARIS. A city and the county-seat of Henry County, Tenn., 110 miles west of Nashville; on a fork of the West Sandy River, and on the Louisville and Nashville and the Nashville, Chattanooga and Saint Louis railroads (Map: Tennessee, C 4). It is the centre of a fertile region, producing cereals, cotton, and tobacco, and has several tobacco and medicine manufactories, planing mills, flouring mills, and repair shops of the Louisville and Nashville Railroad. Population in 1890, 1917; in 1900, 2018.

PARIS. A city and the county-seat of Lamar County, Texas, 100 miles northeast of Dallas; on the Texas and Pacific, the Texas Midland, the Saint Louis and San Francisco, and the Gulf, Colorado and Santa Fe railroads (Map: Texas, G 3). It has a fine United States court and post-office building, and a county court-house of granite. The city is the centre of a productive cotton-growing section, and controls extensive wholesale and shipping interests. Its industrial establishments include large cottonseed-oil mills, a large compress, cotton gins, a flouring mill, canning factory, brick plants, etc. Paris, settled in 1841, is governed under a charter of 1889,

which provides for a mayor, elected every two years, and a council. The water-works are owned and operated by the municipality. Population, in 1890, 8254; in 1900, 9358.

PARIS, Congress of. See Crimean War; Declaration of Paris; Paris, Treaties of.

PARIS, Treaties of. The name given to important treaties of peace concluded at Paris in 1763, 1783, 1814, 1815, 1856, and 1898.

The treaty of February 10, 1763, was concluded between France and Spain on the one hand, and Great Britain and Portugal on the other, at the end of the Seven Years' War (q.v.). It provided for a cession to Great Britain of Canada, Prince Edward Island, Cape Breton, and the region east of the Mississippi River, possessed or claimed by France, except New Orleans and the isle on which it stood. Great Britain was confirmed in the possession of Nova Scotia. France retained a share in the fisheries of Newfoundland and the Saint Lawrence, under certain restrictions, together with the isles of Saint-Pierre and Miquelon. In the West Indies, Great Britain restored Martinique and Guadeloupe, and ceded Saint Lucia to France, while France ceded to Great Britain Dominica, Saint Vincent, Grenada, and Tobago (the last previously neutral territory). France ceded Senegal to Great Britain. She recovered possession of Pondicherry, but had to agree not to maintain military settlements in Bengal. In Europe, France relinquished her conquests in Germany, restored Minorca, and engaged to maintain the status quo. By way of compensation for the loss of Florida, which Spain ceded to Great Britain, which had fallen into the hands of that Power, France ceded to Spain the bulk of Louisiana, including New Orleans. The effect of the treaty was to establish the supremacy of Great Britain in America, in India, and on the seas.

The Treaty of Paris of September 3, 1783, between Great Britain and the United States, marked the close of the American Revolution and recognized the independence of the colonies. Simultaneously with its conclusion Great Britain made peace with France and Spain at Versailles. The four difficult questions upon which the British and American negotiators labored at great length before reaching a settlement related to (1) the boundaries of the United States; (2) fishing rights on the coast of Newfoundland; (3) payment of private debts due from Americans to British creditors; and (4) compensation of the loyalists. As finally concluded, the treaty recognized the Mississippi River as the western boundary from a point west of the Lake of the Woods to the thirty-first parallel of north latitude; thence the boundary was to run due east to the Appalachicola (Chattahoochee) River, thence down the middle of that stream to the Flint River, thence to the head of the Saint Mary's River, and thence along the middle of that river to the Atlantic Ocean. The Great Lakes and the Saint Lawrence River were recognized as the northern boundary to the forty-fifth parallel. Thence to the Atlantic Ocean the boundary was described as following the highlands which divide those rivers that empty themselves into the Saint Lawrence from those which empty into the Atlantic; thence from the highlands to the source of the Saint Croix River; and thence down that stream to its mouth. (See Northeast Boundary Dispute; also Northwest Boundary Dispute.) With regard to the fisheries, it was provided that the Americans were to continue to enjoy the same rights of fishery at Newfoundland and vicinity which they had enjoyed as English colonists, and while they were to be permitted to dry their fish on other unsettled shores, they were not allowed to do so on the island of Newfoundland. At the same time they were to have the exclusive right of fishing on their own coasts. On the third point it was provided that creditors on either side should meet with no lawful impediment to the recovery of the full value in sterling money of all bona fide debts contracted before the war. With regard to the loyalists, the American negotiators consented that Congress should be asked to recommend to the State legislatures to provide for the restitution of confiscated estates, and to abandon all future confiscations and to cease all prosecutions commenced against persons known as loyalists. The navigation of the Mississippi was declared to be free to the subjects of both nations. By the terms of the Treaty of Versailles, signed on the same day as that of Paris, Great Britain restored Florida and Minorca to Spain and ceded Tobago to France. Senegal was relinquished to France.

The Treaty of Paris of May 30, 1814 (First Peace of Paris), was concluded between France on the one hand and the representatives of all the great Powers of Europe on the other. It provided that France should surrender all her conquests except slight territories on the northern and eastern boundaries, leaving her with the boundaries of 1792. She was to pay no indemnity, and was to retain all works of art taken from conquered countries with a few exceptions. Most of the colonies taken from her by Great Britain were restored; Holland was restored to the House of Orange; of the colonial possessions wrested from Holland, Great Britain retained Ceylon, the Cape of Good Hope, and part of Surinam (Guiana); Switzerland was declared independent; Italy, except the Austrian provinces, was to consist of independent States; a similar arrangement was made for Germany; the navigation of the Rhine was to be open; and the settlement of all other questions of European concern was to be intrusted to a European congress to be convened at Vienna. (See Vienna Congress.) By secret provisions it was agreed that the Allies should control the distributions of territory at the congress; that Austria should receive Northern Italy; that the King of Sardinia should receive Genoa; and that Belgium and Holland should be united as a defensive territory against France.

The Treaty of Paris of November 20, 1815 (Second Peace of Paris), was concluded between France on the one hand and the Allies on the other, and essentially modified the treaty of 1814. By this treaty France was deprived of certain small territories to the north and east which she had been allowed to retain by the treaty of 1814. She was also compelled to pay [illegible] Allied Powers for the expenses of the war, amounting to some 700,000,000 francs, the occupation of her frontier provinces for a period of five years by an allied army of 150,000 men, and to defray the cost of this occupation out of her own revenues. Indemnities

to a large amount were allowed several of the allies for the spoliations committed on them by the French armies, the total amount of the entire indemnity exceeding £60,000,000.

The Treaty of Paris of March 30, 1856, was concluded among the Powers at the close of the Crimean War (q.v.), and settled a number of questions of European public law of great importance. It provided that the Black Sea should be neutralized, and that it should be thrown open to the merchant marine of every nation. All war vessels of every nation, including Russia and Turkey, were forever prohibited from entering that sea. The Czar and the Sultan agreed not to establish upon its coasts any military fort or arsenal. A portion of Bessarabia was surrendered by Russia, and the River Danube was declared to be open to free navigation. For the purpose of insuring free navigation, and for policing and improving the river, it was placed under the supervision of an international commission. This provision was declared to be a part of the public law of Europe. The Sublime Porte was formally admitted to the European concert, and the Powers engaged to respect the independence and integrity of the Ottoman Empire. The Danubian principalities of Moldavia and Wallachia were to continue under the suzerainty of the Porte, Russia renouncing her protectorate over them and the Powers guaranteeing all the privileges and immunities of which they were then in possession. Several important principles of international law were agreed upon at the same time, and were embodied in the Declaration of Paris (q.v.).

The Treaty of Paris of December 10, 1898, terminated the Spanish-American War. Spain relinquished her sovereignty in Cuba, and ceded Porto Rico, the Philippine Islands, and the island of Guam to the United States, from which she received the sum of $20,000,000.

PARIS, University of. One of the oldest and largest universities in the world. It had its inception in the schools of Notre-Dame, Sainte Geneviève, and Saint Victor, and first comes into prominence about 1170. In the early part of the twelfth century Paris was already the noted seat of a number of great masters, among whom were William of Champeaux and his pupil Abélard (q.v.). Thousands of scholars from all over Europe flocked to Paris. Hence arose the necessity for common protection against the impositions of citizens and particularly against the chancellor of Notre Dame, who possessed the right to grant the 'license to teach' and thus constituted the quasi head of the university, and from a mere association of masters there gradually developed a corporation with special rights and privileges. In 1200 Philip Augustus granted a charter conceding among other privileges the right of students to be tried in an ecclesiastical court. In 1207 there is mention made of 'Communitas Scholarium' and 'Universitas Magistrorum,' indicating a fully organized Studium Generale. The chancellor's power to grant licenses was somewhat neutralized by the custom of Inception, which obliged a candidate to deliver an inaugural address before being permitted to associate with the masters. In 1229 a bloody fight between students and citizens caused an emigration which greatly benefited Oxford. Two years later, however, Pope Gregory IX. came to the assistance of the university, and masters and scholars returned in large numbers. Popes Honorius III. and Gregory IX., by siding with the masters in these disputes, acquired an enormous influence over the affairs of the university. The corporation, which at first was nothing more than an association of masters, now consisted of masters and scholars, although the right to vote was vested in the masters only. The university was divided into the superior faculties, viz. theology, medicine, and law, and the inferior faculty of arts ever, on account of the predominance of their number the rector of the faculty of arts became practically the head of the university in the fourteenth century. The arts faculty was divided into four nations: French, Picards, English, and Normans. In the Congregations of the university there were seven voices, the nations controlling four and the other faculties three. In the middle of the thirteenth century the university entered into a series of litigations with the aggressive Mendicants, who included among their teachers such men as Thomas Aquinas, Alexander of Hales, and Saint Bonaventura. They established three chairs in theology without taking the oath of obedience to the university statutes. After a struggle of seven years the Pope decided against the masters and the Mendicant scholars were placed on a basis of equality with the seculars. The contest with the Mendicants, however, was fortunate in that a series of 'colleges' or foundations modeled after those of the Orders where laymen could get lodging, care, and instruction were established. The most famous of these were the Sorbonne (q.v.), founded by Robert de Sorbon about 1257, and the College of Navarre.

In the fourteenth and fifteenth centuries the university attained its highest stage of development. Princes and popes courted its favor, and followed the teachings of its famous theologians and jurists. It became the centre of the educated world. However, its conservative attitude toward the humanism of the fifteenth century; the civil wars; the constantly increasing centralization of the French Government, which crippled free university life—all contributed toward the gradual decline of its fame. The theological faculties, owing to the establishment of the bishop seminaries, lost their prestige as educational institutions, and degenerated into mere degree-conferring bodies. The famous jurists also forsook Paris for the practical business of administration in the provinces. The faculties of arts and the colleges came to serve the purposes of secondary education, while most of the higher education fell into the hands of the Jesuits, who established a number of colleges in France. The university never flourished again as during the mediæval period. Henceforth the great scholars of France were connected with the Academy. During the Revolution the university went down with the rest of the French universities. In 1808 Napoleon reorganized it as part of the University of France, and until 1896 it was known as the Facultés de Paris. In 1902 it consisted of the following faculties, school, and administrative body: (1) The Conseil de l'université; (2) the Protestant theological faculty; (3) the medical faculty, including the Musée Dupuytren, established in 1835; (4) the law faculty; (5-6) faculties of science and letters at the Sorbonne; (7) the school of pharmacy.

The total attendance is over 12,000. The library contained, in 1902, 477,590 volumes, including 1590 manuscripts. Consult: Jourdain, *Histoire de l'université de Paris au XVIIme et au XVIIIme siècle* (Paris, 1862-66); Budinszky, *Die Universität in Paris und die Fremden an derselben im Mittelalter* (Berlin, 1876); and Denifle and Chatelain, *Chartularium Universitatis Parisiensis* (Paris, 1889 et seq.). See article UNIVERSITY.

PAR'IS (Lat., from Gk. Πάρις, of unknown etymology), also known as ALEXANDER. In Greek legend, the second son of Priam, King of Troy and Hecuba, and cause of the Trojan War. His mother dreamed that she gave birth to a firebrand, which set the whole city on fire, a dream interpreted by Helenus or Cassandra to signify that the child would bring the city to destruction. To prevent this, Priam caused the infant to be exposed upon Mount Ida, where he was found and brought up by shepherds, among whom he distinguished himself. After a time he accidentally discovered his origin, and was received by Priam as his son, but continued to live on Mount Ida, where he had won the love of the nymph Œnone, daughter of the river-god Cebren. While on Ida he was appealed to as umpire in a strife which had arisen among the three goddesses, Hera, Athene, and Aphrodite, as to which of them was the most beautiful, the goddess Eris (strife) having revengefully flung among them at the marriage of Peleus, to which she had not been invited, a golden apple (of discord) inscribed *To the Most Beautiful*. Each of the three endeavored to bribe him. Hera promised him dominion over Asia; Athene, military renown; Aphrodite, the fairest of women for his wife, Helen, the wife of Menelaus. Paris decided in favor of Aphrodite, hence the animosity which the other two goddesses displayed against the Trojans in the war that followed. Paris now equipped a ship and sailed to Sparta, where, with the aid of Aphrodite, he persuaded Helen to elope with him to Troy. Upon this followed the Trojan War, in which the princes of Greece joined Menelaus in his endeavor to recover his wife. In the *Iliad* Paris is at times represented as a cowardly boaster, disliked by his countrymen, while in other portions of the poem he is valiant and skillful in battle, especially with his bow, and is welcomed on his appearance by the Trojans. His manly beauty is more than once praised. In the epic he was said to have killed Achilles, while endeavoring to force his way through the Scæan gate into Troy, but the later writers elaborated the story of Achilles's love for Polyxena, and represented the Greek hero as enticed to the temple of Apollo and there murdered by Paris and Deiphobus. The *Little Iliad* told of the death of Paris by the arrow of Philoctetes, who owned the bow and arrows of Heracles. The Alexandrian writers, to whom the Œnone episode is due, added the version that when Paris was wounded by the poisoned arrow he turned for healing to his old love on Mount Ida. She, however, refused to employ her magic skill, and the hero died, whereupon, in remorse, she destroyed herself. Representations of Paris are common in ancient art. On the earlier vases he appears at the judgment of the goddesses as a shepherd, often with the lyre, and amid his flocks. Later he is usually distinguished by the Phrygian cap, and sometimes by the close-fitting trousers and jacket worn by the Asiatics.

PARIS, pä'rē', GASTON (1839-1903). A French philologist, born at Avenay, son of Paulin Paris. He studied Romance philology for two years at Göttingen and Bonn, where he was for a while associated with the illustrious founder of modern Romance philology, Friedrich Diez. Having gone back to France, he worked at the Parisian École des Chartes and became director of the École des Hautes Études. He gave to his department of it such fame that students came to him from all parts of the world. He was also soon associated with the work in the Collège de France, and succeeded to the chair of his father when the latter retired in 1872. He was one of the staff of the *Revue Critique* from 1866 to his death, and in 1872 with his life-long fellow-worker, Paul Meyer, he founded the *Romania*, one of the most important of the Romance journals. In 1895 Professor Paris was made director of the Collège de France, and in 1896 he was elected to the French Academy. He had long been a member of the Institute. Since Sainte-Beuve, who gave little attention to the linguistic side, the French nation had had no critic so great as Gaston Paris. In him the philologist and the lover of beauty were at one. Paris was revered among literary men. Toward the end of his life he was at the head of scientific literary criticism in France. He had no showy theories, but his discoveries were many, and his knowledge was so wide that other great scholars were loath to assail his views. Yet his influence, which had been won by his steadfastly scientific attitude, and by the moderation, clearness, and charm of his thought, created no doctrinary school. He had rare personal dignity, a keen but sober wit, an extraordinary memory, and a wide acquaintance with men. Paris devoted himself mainly to the language and literature of France. He excelled not only in textual criticism, but in teaching and in arousing a sound love of old literature. In 1902 Paris became head editor of the *Journal des Savants*, and had other great work on hand when he died in Cannes, March 5, 1903, the most famous of Romance scholars, with disciples in all civilized countries. Some of the more important of his productions, besides the manifold articles to be found in the *Romania* and other reviews, are: *Étude sur le rôle de l'accent latin dans la langue française* (1862; new ed. 1896); *De Pseudo-Turpino* (1865); *Histoire poétique de Charlemagne* (1865); *Les contes orientaux dans la littérature française du moyen âge* (1875); *Le petit Poucet et la grande Ourse* (1875); *La poésie au moyen âge* (1885); *La littérature française au moyen âge* (Paris, 1888); *Poèmes et légendes du moyen âge* (1900); *Poètes et penseurs* (1896). Perhaps his most fascinating work is his biography and literary estimate of François Villon (1901). Among the notable texts edited by him are the *Vie de Saint Alexis*, with L. Pannier (1872; new ed. 1887), a remarkable work, and the *Extraits de la chanson de Roland*; also *Merlin*, and *Les miracles de Notre Dame*. Consult: Todd, "Gaston Paris, Romance Philologist and Member of the French Academy," in *Publications of the Modern Language Association*, vol. xii. (Baltimore, 1897), and *Romania* for April (Paris, 1903).

PAR'IS, JOHN AYRTON (1785-1856). An English physician and author. He was born and was educated at Cambridge, where, after pursuing courses of study at Edinburgh, he took his medical degree in 1808. He began the practice of his profession in London, was made physician to Westminster Hospital, and later settled in Cornwall. There he obtained a large practice, studied natural history, and founded the Royal Geological Society of Cornwall. Returning to London, he lectured on materia medica and the philosophy of medicine at the Royal College of Physicians. He became a censor of the Royal College of Physicians in 1817; delivered the Harveian oration before it in 1843, and the next year succeeded Sir Henry Halford in its presidency, retaining that office until his death. Among his works are a *Pharmacologia* (1812), long the standard treatise on the subject; a *Treatise on Diet* (1827); *Philosophy in Sport Made Science in Earnest* (1827), a popular treatise on physical science; and a *Life of Sir Humphry Davy* (1831).

PARIS, pȧ'rē', LOUIS PHILIPPE D'ORLÉANS, Count of (1838-94). Pretender to the crown of France. He was born in Paris, August 24, 1838, being the eldest son of Ferdinand, Duke of Orleans, and grandson of Louis Philippe. On the death of his father in 1842 the Count of Paris became the French heir apparent. He was carefully educated in Germany and later in England, whither his mother had removed after the events of 1848. A journey to Syria with his brother, the Duke of Chartres, in 1859, resulted in the publication of a journal of the voyage, entitled *Damas et le Liban*. Early in 1861 the Count of Paris became interested in the Civil War in the United States, offered his services with his brother's to the Federal Government, and with their uncle, the Prince de Joinville, the two were attached to the staff of General McClellan, with the rank of captain. They remained in active and efficient service in all the disastrous battles of that campaign, and only retired when the attitude of France toward Mexico gave cause of offense to the United States. The Count of Paris returned to England in the summer of 1862, and shortly afterwards began to appear as a contributor to the *Revue des Deux Mondes*, though under a nom de plume. In 1864 he married his cousin Isabella, the daughter of the Duke of Montpensier. In 1871 he was chosen to the National Assembly, which voted that his property in France, confiscated by Napoleon, should be restored. In 1873 the Count of Paris made a formal resignation of the claims of his family to the throne of France by a visit to the Count of Chambord at Frohsdorff, but after the latter's death in 1883 he was generally regarded as the Count of Chambord's successor and as the chief of the Legitimist Party. By the Expulsion Act of 1886 the Count of Paris and his family were compelled to leave France. He settled in England and devoted himself to literary pursuits, though occasionally issuing a royal manifesto to the people of France. Of his eight children, the most noteworthy is the eldest, Philippe, Duke of Orleans. The Count of Paris revisited the United States, where he was well received, in 1890. He died at Stowe House, Buckinghamshire, England, September 8, 1894. Of his writings, the most important are: *De la situation des ouvriers en Angleterre* (1869), which has been translated into English and German, and *Histoire de la guerre civile en Amérique* (1874-75), an able military history, which has been translated.

PAR'IS, MATTHEW (c.1200-59). The greatest English historian of the Middle Ages. In 1217 he entered the Monastery of Saint Albans, where Roger of Wendover (q.v.) was historiographer. When Roger died in 1236 Paris took up the work of continuing the *Chronica Majora*, which had been brought to the year 1235. Paris evidently enjoyed a wide renown even in his own day, for about 1246 he was specially invited by King Haakon IV. of Norway to reorganize the Abbey of Saint Benet Holm, and was ordered by Pope Innocent IV. to investigate its spiritual condition also. He returned to England in 1249 laden with presents. With the year 1250 Paris intended to end his chronicle, but new events aroused his interest, and the great work ended only nine years later. An abridgment which he prepared is known as *Historia Minor*, and extends from 1067 to 1253, and contains a few incidents not noted in the *Chronica Majora*. In addition, Paris wrote the *Vitæ Abbatum S. Albani*, and the *Addinotimenta*; the latter contains charters, etc., supplementing both the *Chronica Majora* and the *Vitæ*. He died probably about May, 1259. In his own day Paris was considered a universal scholar, and was indeed versed in most of the learning of his time. There is a continuation of his works ascribed to Rishanger (q.v.). All of the works of Paris are published in the *Rolls* series. For other editions and works connected with Paris, consult: Gross, *Sources and Literature of English History* (London, 1900); Potthast, *Bibliotheca Historica Medii Ævi*, vol. ii. (Berlin, 1896).

PARIS, pȧ'rēs', PAULIN (1800-81). A French historian and philologist, born at Avenay, Marne. His appointment in the manuscript department of the National Library gave him opportunity to study the old French writers. He was made a member of the Academy of Inscriptions (1837), wrote memoirs for its publications, and for those of other learned societies to which he belonged, and was professor of mediæval history in the Collège de France (1853-72). His most notable achievement was his catalogue, *Manuscrits français de la bibliothèque du roi* (1836-48). Besides other translations, he made a French edition of Byron (1830-32-36). He edited the *Grandes chroniques de France* (1836-40) and other works. His own *Etudes sur François I.* (1885) were published posthumously.

PARIS BASIN. A geologic basin eroded in the Cretaceous rocks of the vicinity of Paris and subsequently filled with Tertiary marls and sands. The basin occupies an oblong area of about 20,000 square miles, which is divided by the Seine into a northern and a southern half. The underlying strata are chiefly remarkable for the rich harvest of organic remains which they supplied to Cuvier, and which led to the foundation of the modern science of paleontology.

PARISH (OF. *parosse, paroiche*, Fr. *paroisse*, from Lat. *parœcia, parœcia*, from Gk. *παροικία, paroikia*, ecclesiastical district, from *πάροικος, paroikos*, neighboring, from *παρά, para*, beside, beyond + *οἶκος, oikos*, house). A division either of territory or population, originally ecclesias-

tical, but in some places also civil. The word in its Greek form was applied in its earliest ecclesiastical use to a body of Christians living in a city and its neighborhood to distinguish them from the other inhabitants. Gradually it came to mean the district under the care of a bishop. The subdivision of the dioceses of the kingdoms of England into what are now known as parishes is not supposed to have taken place much earlier than the time of King Edgar (970), the boundaries of the parishes being fixed by those of manors. In this later ecclesiastical sense, the parish came to be the territory committed to the charge of one priest. But since the modern development of the English poor laws the term parish in the statutes defines a district for which a separate poor rate is or may be made and a separate overseer appointed. On the temporal side the administration is in the hands of the vestry, and especially of the church wardens, one of whom is usually nominated by the incumbent, the other elected by the ratepayers. Their duties are to have a care for the fabric of the Church and other property, preserve order during divine service, and provide whatever is necessary for its due celebration. There has for many centuries been an apparent confusion in the use of the term, arising from the fact that as a rule the same body of individuals represented both the civil and the religious organizations. From an early period, however, the ecclesiastical side of the parish has predominated over the civil side, and this was the condition of affairs at the time of the first English settlements in America. It was in Virginia that the parish as it existed in England was developed, although, on account of the peculiar circumstances of the colony, it came later than the military and civil divisions, and therefore never possessed civil powers equal to the parishes of the mother country. The word parish was used in the New England colonies to denote the township from the ecclesiastical point of view, as well as a portion of a township not possessing town rights. In the United States at the present time the word parish as an ecclesiastical district is used loosely by the Episcopal and Reformed Episcopal churches, and often with a more definite territorial limitation by the Roman Catholic Church. In the Episcopal Church the parish is the local unit of organization, and, as a rule, possesses a corporation composed of the rector, wardens, and vestrymen. In Louisiana the term parish is given to the civil territorial divisions called counties in other States.

PARISH CLERK. A secular officer in the parishes of the Church of England and in some of the colonial churches of the Anglican communion. It is the duty of a parish clerk to represent the congregation in public worship. A person in holy orders may be appointed, but such a clerk is usually a layman, who by the canon law is required to be at least twenty years of age and of competent skill in singing.

PARISH SCHOOL. A term applied to institutions located in the district called the parish.

In the capitulary of 789 Charles the Great directed every monastery to have its school where boys might be taught the Psalms, the system of musical notation, singing, arithmetic, and grammar. Such schools would, of course, reach only a very little beyond those designed for the Church, but in 796 Theodulphus, Bishop of Orléans, issued a similar capitulary to the clergy of his diocese, requiring them to give gratuitous instruction to the children of the laity in every town and village. From time to time other decrees by both Church and State attempted to render more effective the popular instruction that the clergy of France were supposed to give. After the revocation of the Edict of Nantes (1685), Louis XIV. decreed that there should be in every parish a school to teach the Roman Catholic religion, reading, and even writing. The 'Brethren of the Christian Schools,' founded in 1679 by La Salle, a canon of the cathedral church at Rheims, afforded a most effective means of education for the common people.

The early Protestant reformers, Luther, Melanchthon, Zwingli, Knox, and others, were anxious that the common people should have proper religious instruction, and to this end they deemed the rudiments of reading and writing of the greatest importance. They urged upon the pastors the duty of attending to this matter, and the early Protestant parish schools either were taught by the pastors or their assistants or were at least under their supervision. As the schools were taken in hand by the State, ecclesiastical supervision was retained, and it has been done away with very slowly, vestiges of it remaining in Prussia even to-day.

Consult: M. Arnold, *Popular Education of France* (London, 1861), and Balfour, *Educational Systems of Great Britain and Ireland* (Oxford, 1898).

PARISIUS, pä-rē'zē-us, Ludolf (1827–1900). A German politician and author. He was born at Gardelegen, studied law at Halle, and practised in his native town. In Berlin he became prominent in the politics of the Progressist Party as an editor of the *Parlamentarische Korrespondenz aus der Fortschrittspartei*, and a member of the Prussian House of Deputies. Afterwards he joined the National Liberal Party, and sat in the Reichstag in 1874–77 and 1881–87. In 1874 he was made conspicuous by his attacks on Von Mühler, Minister of Education. He wrote various legal commentaries; a valuable history, *Deutschlands politische Parteien und das Ministerium Bismarcks* (1877); and several novels.

PARIS SKETCH-BOOK, The. A collection of sketches and stories by W. M. Thackeray (1840).

PARJANYA, pär-jän'yà. In the Veda (q.v.), the rain-god. He is mentioned about thirty times in the Rig-Veda, where he is celebrated in three hymns. His action, however, is not wholly independent, as he, like the Maruts, is subject to Mitra and Varuna (q.v.). Parjanya, as being a rain-deity, is frequently associated with thunder, and occasionally also with lightning. It naturally follows from his functions that he is in a special degree the god who promotes and fosters vegetation. His wife is by implication the earth, although one passage of the Atharva-Veda expressly calls her name Vasa. Parjanya is mentioned in connection with several other deities, especially with Vata, the wind, and less often with the Maruts, the storm-gods, and with Agni, the fire. He has likewise many points of resemblance with Indra (q.v.), with whom in the epic he is regularly identified.

Parjanya is often thought to be identical with the Lithuanian thunder-god Perkúnas, but this view must be regarded as more inviting than probable. Consult Macdonell, *Vedic Mythology* (Strassburg, 1897).

PARK. See Parks and Playgrounds.

PARK (MEng. *park*, *parrok*, from OF., Fr. *parc*, and from AS. *pearroc*, OHG. *pfarrih*, Ger. *Pferch*, park, of uncertain etymology, possibly connected with provincial Eng. *par*, inclosure for domestic animals, and with OHG. *sparro*, Ger. *Sparren*, Eng. *spar*). Military. Any inclosed space, in which are stored either guns, wagons, or supplies. Specifically, an artillery park is one consisting of guns and their equipment; and similarly an engineers' park would consist of wagons, pontoons, animals, etc. Wagons or other train vehicles, brought together for purposes of storage, camping, or for defense against attack, are said to be parked.

PARK, Edwards Amasa (1808-1900). An American theologian. He was born in Providence, R. I., December 29, 1808. He graduated at Brown University in 1826, Andover Seminary in 1831, and was ordained as colleague pastor with Rev. Richard Salter Storrs of Braintree, Mass., in the latter year. In 1835 he became professor of intellectual philosophy at Amherst College, and the following year was called to Andover Theological Seminary as professor of sacred rhetoric. Nine years later he was transferred to the chair of systematic theology, succeeding the first incumbent, Rev. Dr. Leonard Woods. In this position Professor Park remained till he retired from active labor in 1881. He died June 4, 1900. Dr. Park was a famous preacher, but he was before all things else a teacher, and his influence from his lecture room was second to that of no man of his generation. In a sense he was the last of the 'New England' theologians. (See New England Theology.) His system may be defined in a phrase as that of the Westminster Confession, grounded upon a new philosophy and purged of its artificial and realistic details. His literary labors appeared chiefly in the *Bibliotheca Sacra*, which he founded in 1844 and continued to edit till 1884. He also published memoirs of Samuel Hopkins (Boston, 1854), Nathaniel Emmons (ib., 1861), and others; and a volume of *Discourses on Some Theological Doctrines as Related to the Religious Character* (Andover, 1885). Consult the memorial address by R. S. Storrs (New York, 1900) and the volume in celebration of his ninetieth birthday (Boston, 1898).

PARK, Mungo (1771-1806). An eminent African explorer. He was born near Selkirk, in Scotland, was educated in Edinburgh University, and devoted his attention particularly to the study of surgery. In 1792 he went to the East Indies as a surgeon in the sea service of the East India Company. Returning from his first voyage, he offered his services to the African Association, which for half a century was the chief promoter of the exploration of Africa. Under its auspices, in 1795, at the age of twenty-four, he went to the Gambia River with instructions to reach the Niger River and to ascertain its source, its course, and, if possible, its termination. After acquiring some knowledge of the Mandingo language, he set out for the interior in December, 1795, crossed the Senegal, and finally reached the Niger at Sego in July, 1796. He went down the river until he was within fifteen days' travel of Timbuktu, which he could not reach on account of the tropical rains and because he had entered the country of merciless and fanatical Mohammedans. After having been in the interior for nineteen months he returned home and wrote *Travels in the Interior of Africa* (1799; frequently reprinted).

The achievements of this solitary white man in inner Africa excited the widest interest. He had brought to light more important facts respecting the geography of Western Africa than had any former traveler. By pointing out the positions of the sources of the Senegal and Gambia, he showed where to look for the elevated parts of the country, and for the water-partings between the Gambia and Niger, and between the fertile country and the desert. The success of his first journey induced the British Government to employ him to complete the discovery of the course of the Niger. He received a captain's commission, and was accompanied by his brother-in-law, Anderson, and forty-five English soldiers, besides natives. He started into the interior in April, 1805. The employment of white soldiers soon proved a fatal mistake. Many died, and, when the party embarked in canoes on the Niger to float down to its mouth, it had dwindled to seven men. Anderson died in October. Undaunted by his misfortunes, Park was resolved to find the mouth of the Niger. He sailed more than 1000 miles, but, entering a stretch of rapids below Yuri on the lower river, while both shores were lined with hostile natives, the boat was wrecked, and Park and his three surviving comrades were downed. The journal he sent home and information obtained by later explorers give all the facts known about his last expedition. An "Account of the Life of Mungo Park," by Wishaw, was published in Park's *Journal of a Mission to the Interior of Africa* (1815).

PARK, Roswell (1852—). An American physician, born at Pomfret, Conn. He studied at Racine College and at Harvard, and in 1876 graduated in medicine at Northwestern University. During the following years he was interne at several hospitals and a member of the faculties of the Woman's Medical College (Chicago), Northwestern University, and Rush Medical College. In 1883 he was elected professor of surgery at the University of Buffalo, and afterwards became surgeon to the Buffalo General Hospital and director of the State Pathological Laboratory at Buffalo. His writings include *Text Book of Surgery* (1896) and *History of Medicine* (1897).

PARK CITY. A city in Summit County, Utah, 31 miles east-southeast of Salt Lake City; on branches of the Union Pacific and the Rio Grande Western railroads (Map: Utah, B 1). It is in a rich silver-mining district, and its chief mechanical industries are metallurgical. Population, in 1890, 2850; in 1900, 3759.

PARKE, John Grubb (1827-1900). An American soldier, born in Chester County, Pa. He graduated at West Point in 1849, and was assigned to the topographical engineers. From 1857 until the outbreak of the Civil War he was engaged in surveying the northwest boundary. In 1861 he was commissioned brigadier-general of volunteers, and was placed in command of one of the three brigades in Burnside's North

Carolina expedition, during which he assisted at the capture of Roanoke Island (February 8, 1862) and Newbern (March 14, 1862), and commanded at the capture of Fort Macon (April 26, 1862). For these services he was promoted major-general of volunteers in 1862, and was made chief of staff of the Ninth Corps, with which he served at South Mountain (September 14, 1862) and Antietam (September 16-17, 1862). When his superior, General Burnside, was appointed commander of the Army of the Potomac, Parke remained his chief of staff until after the battle of Fredericksburg (December 13, 1862). He accompanied the Ninth Corps into Kentucky the following March, and commanded it before Vicksburg. At Jackson, Miss. (July 16, 1863), he commanded Sherman's left wing; his corps was ordered north, and he took part in the siege of Knoxville (November 15-December 5, 1863) and the pursuit of Longstreet into Virginia. He participated in the battles of the Wilderness and Spottsylvania. During the latter part of the Richmond campaign he again commanded the Ninth Corps, which he led at the capture of Petersburg and in the pursuit to Appomattox. He was mustered out of the volunteer service on January 15, 1866, and returned to the boundary survey. Subsequently he had charge of various military works, and was superintendent of West Point from 1887 to 1889, when he retired from active service with the rank of colonel of engineers and the brevet of major-general in the Regular Army. He published *Compilations of Laws of the United States Relating to Public Works for the Improvement of Rivers and Harbors* (1877; rev. ed. 1887) and *Laws Relating to the Construction of Bridges Over Navigable Waters* (1882; rev. ed. 1887).

PARKER, Alton Brooks (1852—). An American jurist. He was born at Cortland, N. Y., and graduated at the Albany Law School in 1872. It was his early intention to fit himself for a teacher, and by much sacrifice and perseverance he succeeded in working his way through the Cortland Normal School. Teaching, however, proved distasteful to him, and he entered the law office of Schoonmaker and Hardenburgh at Kingston, N. Y., and eventually completed the course at the Albany Law School. In 1877 Parker was elected Surrogate of Ulster County, and he held that position until 1885. He was a delegate to the Democratic National Convention in 1884, and in 1885 successfully managed the Democratic gubernatorial campaign. In 1886 Parker was appointed by Governor Hill to a vacancy in the Supreme Court, and in the autumn of the same year he was elected as the candidate of both parties for a full term. He was transferred to the Appellate Division of the Supreme Court in 1889, and in 1897 reached the culmination of his judicial career when he was chosen Chief Judge of the Court of Appeals. Judge Parker had many opportunities for political preferment, notably the Democratic nomination for Governor in 1902, but refused to take advantage of them.

PARKER, Edward Harper (1849—). An English Chinese scholar. From 1869 to 1871, in the character of student interpreter, he traveled in Mongolia, and afterwards he served in British consulates at Wenchow, Fusan, and Shanghai, and traveled in Oceanica, Eastern Asia, and North America. He retired from the consular service in 1895, became reader in Chinese at University College, Liverpool, in 1896, and in 1901 was appointed to a chair in Chinese at Owens College, Manchester. His works include: *Comparative Chinese Family Law* (1879); *Up the Yangtsze* (1892); *Burma* (1893); *A Thousand Years of the Tartars* (1895); and *China* (1901).

PARKER, Foxhall Alexander (1821-79). An American naval officer, born in New York City. He graduated at the Naval School in Philadelphia in 1843, served against the Florida Indians, and in 1850 became a lieutenant. In the Civil War he first commanded the gunboats *Wabash* and *Wabash*, and after 1863 the Potomac flotilla. In 1866 he was promoted captain, and in 1872 commander. In 1873 he was chief signal officer of the navy, and from 1878 until his death was superintendent of the Naval Academy at Annapolis. He published: *Fleet Tactics Under Steam* (1863); *Squadron Tactics Under Steam* (1863); *The Naval Howitzer Afloat* (1865); *The Naval Howitzer Ashore* (1865); *The Fleets of the World: The Gatling Vessel* (1876); and *The Battle of Mobile Bay* (1878).

PARKER, Francis Wayland (1837-1902). An American educator, born in Bedford, N. H. He was principal of a school in Manchester, N. H. (1865-68), and of one in Dayton, Ohio, from 1868 until 1872, when he went to Germany for a course at the Berlin University. Afterwards he was school superintendent in Quincy, Mass. (1875-80), supervisor in Boston (1880-83), principal of Cook County, Ill., Normal School (1883-90), and of the Chicago Normal School (1896-99). He was appointed president of the Chicago Institute in 1899. His publications include: *Talks on Teaching* (1883); *The Practical Teacher* (1884); *Course in Arithmetic* (1884); and *How to Study Geography* (1889).

PARKER, Sir (Horatio) Gilbert (1862—). A Canadian novelist, born at Camden East, Addington, Ontario. He studied pedagogy in Ottawa and taught in Frankford and Seaforth. He studied for the ministry at Trinity University, Toronto, held a curacy at Trenton for a short time, and taught in the Belleville Deaf and Dumb Institute, but in 1886 went for his health to Australia. There he took up journalistic work and the writing or adapting of plays, but after his return to Canada was principally known as a writer of romances and short stories, such as *Pierre and His People* (1892); *Mrs. Falchion* (1893); *The Translation of a Savage* (1894); *When Valmond Came to Pontiac* (1895); *The Seats of the Mighty* (1896); *The Battle of the Strong* (1898); *The Lane that Had No Turning* (1900); *The Right of Way* (1901); and *Donovan Pasha* (1902). He made his home in England, was elected Conservative member of Parliament for Gravesend in 1900, and was knighted in 1902. The dramatic quality of his later books won for them considerable popularity, despite their disregard of truth in local color.

PARKER, Horatio William (1863—). An American composer and teacher. He was born at Auburndale, Mass., and was a pupil first of his mother, then of George W. Chadwick and Stephen A. Emery, and subsequently of the Munich Conservatory. After returning to America he became organist of the Garden City Cathedral, Long Island, and professor of music at the Cathedral School. In 1886

he was organist and choirmaster at Saint Andrew's, New York, and two years later went to the Church of the Holy Trinity, Boston. He became professor of music at Yale University in 1894. His oratorio, *Hora Novissima* (1893), has been called by European critics one of the finest of American compositions. Other compositions are: *The Holy Child* (1890); *The Kobold* (1891); *The Dream King* (1893); *Saint Christopher* (1896); *A Northern Ballad*, for orchestra (1899); and choruses, anthems, organ pieces, transcriptions, and some chamber music.

PARKER, Sir Hyde (1739-1807). A British admiral, son of the vice-admiral of the same name, under whom he first served. He was knighted in 1779 for his success three years before in occupying the North River, which was strongly fortified by the colonial forces. He served through the Revolutionary War, was appointed commander-in-chief at Jamaica in 1796, and in January, 1801, was sent into the Baltic to terrorize Denmark. His lieutenant, Lord Nelson, urged bolder action than seemed good to Parker, and in the battle off Copenhagen took command in the lighter vessels because of the shallow channel, and refused to obey the order to retreat issued by Parker, who was loath to infringe the customary rules of naval warfare. Parker was soon replaced by Nelson, and saw no further service.

PARKER, Joel (1795-1875). An American jurist, born at Jaffrey, N. H. He graduated at Dartmouth College in 1811 and, after studying law, practiced at Keene. He was appointed an associate justice of the Supreme Court of New Hampshire in 1833 and became chief justice in 1838. In 1840 he was chairman of the committee on the revision of the State statutes, and in 1847 was called to a chair in the Harvard Law School. Conservative in politics, he opposed during the Civil War the exercise by the President of what he deemed unconstitutional powers. He published: *Non-Extension of Slavery* (1856); *Personal Liberty Laws* (1861); *The Right of Secession* (1861); *Constitutional Law* (1862); *The War Powers of Congress and of the President* (1863); *Revolution and Reconstruction* (1866); *Conflict of Decisions* (1875).

PARKER, Joel (1816-88). An American politician, born near Freehold, N. J. He graduated at Princeton in 1839 and in 1842 was admitted to the bar. In 1847 he was elected to the Legislature by the Democrats, and in 1852 was appointed prosecutor of the Pleas. At the outbreak of the Civil War he was appointed a major-general of militia, and devoted himself to the work of enlisting volunteers. The next year, 1862, he was elected Governor by an unprecedented majority; for, though a Democrat and opposed to the Abolitionists, he was a strong Union man. So energetic and successful was he in raising troops that the draft was never applied in New Jersey; and during Lee's invasion of Pennsylvania in 1863 he induced several recently returned regiments to go again to the front, thereby earning the thanks of the neighboring State. Equally successful was his financial policy, for during his administration the State bonds never sold below par, and the adoption of his plan for wiping out the war debt resulted in its being paid off without special taxation. At the end of his term as Governor, in 1866, he retired to private life, but in 1871 was reëlected. In 1875 he was appointed Attorney-General, and in 1880 and in 1887 an associate justice of the State Supreme Court.

PARKER, Joseph (1830-1902). An English Congregational clergyman. He was born at Hexham, Northumberland. He had little training in the schools, but read much. In 1852 he attended classes at University College, London. In 1853 he became pastor of the Congregational Chapel at Banbury, and remained five years, when he was called to the Cavendish Street Chapel, Manchester. He at first declined on account of a debt contracted in building a new church at Banbury; but the Manchester people assumed the debt, and the transfer was effected. In 1869 he left Manchester and went to London to preach at the Old Poultry Chapel, Cheapside. Here his success was so great that the chapel became inadequate for the congregations, and in 1874 the City Temple on Holborn Viaduct was opened. He continued pastor of the church until his death at his home in Hampstead. His eccentricities did not always secure public approbation, but he was surrounded by enthusiastic admirers who turned the edge of public criticism. He was twice chairman of the London Congregational Board, and twice of the Congregational Union of London and Wales. In 1887 he visited America, and delivered a eulogy on his friend, Henry Ward Beecher. His published works include: *Ecce Deus: Essays on the Life and Doctrine of Jesus Christ* (1868), a reply to *Ecce Homo: The Paraclete* (1874); *The People's Bible* (25 vols., 1885 sqq.); *People's Prayer Book* (1898); *Paterson's Parish* (1898). Works of an autobiographical nature are: *Springdale Abbey, Extracts from the Letters and Diaries of an English Preacher* (1869); *Tyne Chylde, My Life and Ministry, Partly in the Daylight of Fact, Partly in the Limelight of Fancy* (1883); *A Preacher's Life: An Autobiography and an Album* (1899). For his life, consult Adamson (New York, 1903).

PARKER, Louis Napoleon (1852—). An English composer and dramatist, born in Calvados, France, and educated at Freiburg im Breisgau, and at the Royal Academy of Music. From 1877 to 1896 he was director of music in Sherborne School. To this period belong his songs, cantatas, and instrumental music. He was made a fellow of the Royal Academy of Music in 1898. He was connected as author, collaborator, or translator with many successful plays. Among those which he translated are *Magda*, *Cyrano de Bergerac*, and *L'Aiglon*.

PARKER, Matthew (1504-75). The second Protestant Archbishop of Canterbury. He was born at Norwich, August 6, 1504, studied at Corpus Christi College, Cambridge, and was ordained a priest in 1527. At the university he was a distinguished student, and was from an early period favorably disposed toward the doctrines of the Reformation, and lived in close intimacy with some of the more ardent reformers. In 1535 he was appointed chaplain to Queen Anne Boleyn. With this appointment he obtained the deanery of the monastic college of Stoke-by-Clare in Suffolk. Here he appears to have first definitely sided with the reforming party in the Church and State, the sermons which he preached containing bold attacks on different Catholic tenets and practices. In 1538 Parker took the degree of D.D.; and in 1544, after some minor changes, became master

of Corpus Christi College, Cambridge, which he ruled admirably. Three years later he married and probably about this time drew up his defense of the marriage of priests, entitled *De Conjugio Sacerdotum*. In 1552 he was presented by King Edward VI. to the rich deanery of Lincoln. On the accession of Queen Mary he refused to conform to the reëstablished order of things, and was deprived of his preferments, and even obliged to conceal himself. It does not appear, however, that he was eagerly sought after by the emissaries of Mary; for he was very unwilling to disturb the framework of the Church. On the death of Mary and the accession of Elizabeth (1558) he was appointed by the Queen Archbishop of Canterbury. The consecration took place in Lambeth Chapel, December 17, 1559.

The subsequent history of Archbishop Parker is that of the Church of England. The difficulties that beset him were very great. Elizabeth herself was addicted to various 'popish' practices, such as the use of images, and was strongly in favor of the celibacy of the clergy. But his greatest anxiety was in regard to the spirit of sectarian dissension within the bosom of the Church itself. Already the germs of Puritanism were beginning to spring up, and there can be no doubt that their growth was fostered by the despotic caprices of the Queen. Parker himself was manifestly convinced that if ever Protestantism was to be firmly established in the land at all, some definite ecclesiastical forms and methods must be sanctioned to secure the triumph of order over anarchy, and he vigorously set about the repression of what he thought a mutinous individualism incompatible with a catholic spirit. That he always acted wisely or well cannot be affirmed; he was forced into intolerant and inquisitorial courses, and as he grew older he grew harsher, the conservative spirit increasing with his years. He gave the English people the "Bishops' Bible," which was undertaken at his request, prepared under his supervision, and published at his expense in 1572. Much of his time and labor from 1563 to 1568 was given to this work. He had also the principal share in drawing up the *Book of Common Prayer*, for which his skill in ancient liturgies peculiarly fitted him, and it was under his presidency that the *Thirty-nine Articles* were finally reviewed and subscribed by the clergy (1562). Parker died in the palace at Lambeth, London, May 17, 1575.

Among other literary performances, Parker published in 1567 an old *Saxon Homily on the Sacrament*, by Ælfric of Saint Albans, *A Testimonie of Antiquitie Showing the Auncient Fayth in the Church of England Touching the Sacrament of the Body and Blonde of the Lord*, to prove that transubstantiation was not the doctrine of the ancient English Church; edited (1571) the histories of Matthew of Westminster and Matthew Paris; and superintended the publication of a most valuable work, *De Antiquitate Britannicæ Ecclesiæ*, probably printed at Lambeth in 1572, where the Archbishop, we are told, had an establishment of printers, engravers, and illuminators. He also founded the 'Society of Antiquaries,' and was its first president; endowed the University of Cambridge, and particularly his own college, with many fellowships and scholarships, and with a magnificent collection of manuscripts relating to the civil and ecclesiastical condition of England, and belonging to nine different centuries (from the eighth to the sixteenth). His correspondence from 1535 on was published by the Parker Society (Cambridge, 1853). Consult his *Life* by Strype (best ed., 3 vols., Oxford, 1821), and in Hook's *Archbishops of Canterbury*, new series, vol. iv. (London, 1872). In his honor the Parker Society was formed, which published 53 volumes of Elizabethan ecclesiastical literature (Cambridge, 1841-54).

PARKER, Peter (1721-1811). A British naval officer, born probably in Ireland. He entered the navy and became lieutenant in 1743, and captain in 1747. He served in the West Indies, and took part in the capture of Belle-Isle in 1761. For ten years he was out of the service on account of the reduction of the navy. He was knighted and restored in 1772, and in October, 1775, with a small squadron, was sent to coöperate with Sir Henry Clinton in the reduction of the Southern colonies of America. The attempt of Josiah Martin to arouse the Tories of North Carolina failed, and Parker proceeded to Charleston and made the unsuccessful attack on Fort Moultrie June 28, 1776. He aided Lord Howe in the capture of New York in September, and commanded the squadron which afterwards took possession of Rhode Island. In April, 1777, he was promoted to rear-admiral and placed in charge of Jamaica, in 1778. He became vice-admiral in 1779, was made a baronet when he returned to England in 1782, and became admiral in 1787. From 1793 to 1799 he was commander-in-chief at Portsmouth and succeeded Lord Howe as admiral of the fleet. He is perhaps best remembered as the friend and patron of Nelson.

PARKER, Peter (1804-88). A medical missionary and diplomat, born in Massachusetts; graduated at Yale College in 1831; studied theology and medicine at New Haven; was ordained and went to China as a missionary in 1834. He established a hospital at Canton, principally for eye diseases, but soon for other diseases. Dr. Parker possessed great surgical skill, and his fame spread rapidly. War breaking out in 1840 between England and China, the hospital was closed, and Dr. Parker returned to the United States. In 1842 he went back to China and reopened the hospital, which was soon crowded. In 1845 he resigned his connection with the American Board, and became secretary to the United States legation and interpreter of the new embassy, still having charge of the hospital. In the absence of the minister he acted as chargé d'affaires. In 1855, his health having failed, he again visited the United States, but by request of the Government he returned the same year to China as commissioner with full power to revise the treaty of 1844. This position he held until a change of administration in 1857, when, his health again failing, he returned to the United States, and settled in Washington. He published *Reports of the Ophthalmic Hospital at Canton* (Canton, 1836-52); *Statements Respecting Hospitals in China* (London, 1841); *Notes of Surgical Practice Among the Chinese* (Edinburgh, 1846).

PARKER, Theodore (1810-60). An American preacher, scholar, and reformer. He was born in Lexington, Mass., August 24, 1810. His father was farmer and mechanic, and the son

shared actively in his occupations in the intervals of study at the district school and Lexington Academy. He entered Harvard College in 1830 and took the full course of study privately, passing all the examinations, but getting no A.B. degree because he had paid no tuition fees. In 1840 the degree of M.A. was given him. By that time he had mastered several languages which the college did not teach. In 1833 he entered the Harvard divinity school, from which he graduated in 1836. He was ordained June 21, 1837, and the same day installed pastor of the West Roxbury Unitarian Church. May 19, 1841, he preached in South Boston an ordination sermon, "The Transient and Permanent in Christianity," which attracted much attention and elicited violent opposition. With Channing's "Baltimore Sermon" of 1819 and Emerson's Divinity School Address of 1838, it is accounted one of the three epoch-making sermons of the Unitarian development. It was virtually a rejoinder to Andrew Norton's "Latest Form of Infidelity," which, replying to Emerson's address, contended that no man can be a Christian who accepts the teachings of Jesus for any other reason than that of their miraculous attestation. The sermon did not deny the miraculous in Christianity, but men's present need of it. Invited to preach in Boston, his first important sermons were gathered into a book, *A Discourse on Matters Pertaining to Religion* (1842), which increased the controversial heat. There were Unitarians who wished formally to expel him from their fellowship, and did achieve his virtual exclusion. In 1846 the Twenty-eighth Congregational Society was formed in Boston and he became its minister, preaching in the Melodeon until 1852, and for the next seven years to a congregation of several thousands in Music Hall. To much controversial preaching, he added more of the kind represented by his *Lessons from the World of Matter and the World of Man* (1865). He had inherited a tendency to consumption, and in January, 1859, was attacked with severe illness. He was taken to Santa Cruz and there wrote his *Experience as a Minister* (1859). From Santa Cruz he went to England and thence to Italy, and died, May 10, 1860, at Florence, where he is buried in the Protestant cemetery. Theodore Parker's Christianity was anti-supernatural; his philosophy intuitional, transcendental; his theology theistic, affirming God, the moral law, and immortality as certainties of consciousness. His conception of Jesus was purely humanitarian and his criticism of the Bible anticipated the results of more recent orthodox scholarship. He was one of the most conspicuous leaders of the New England abolitionists, uniting a great personal admiration for Garrison with some differences from his views and aims. His works have been published collectively (edited by Frances Power Cobbe, 14 vols., London, 1863-70; 10 vols., Boston, 1870). Consult also his *Historic Americans* (Boston, 1870); *Discourse on Matters Pertaining to Religion*, with introduction by Hannah E. Stevenson (New York, 1871); *Prayers*, with memoir by F. B. Sanborn (Boston, 1882); *Views of Religion*, with introduction by James Freeman Clark (ib., 1885); *West Roxbury Sermons* (ib., 1892). For his life, consult Weiss (New York, 1864), Frothingham (Boston, 1874), and Chadwick (with full bibliography, ib., 1901).

PARKER, Thomas Jeffery (1850-98). A zoölogist, born in London. He received his education in the Royal School of Mines and in the University of London. From 1872 to 1880 he was demonstrator under Huxley at South Kensington and lecturer in biology in Bedford College, London. In 1880 he became professor of biology in the University of Otago, Dunedin, New Zealand. He published a number of memoirs on New Zealand animals, important of which are: *On the Structure and Development of Apteryx* and *On the Cranial Osteology, Classification, and Phylogeny of the Dinornithidæ*. He also wrote the following text-books, in which great literary and artistic ability are joined with extensive knowledge and pedagogical skill: *Zoötomy* (1884); *Lessons in Elementary Biology* (1890); *A Text-book of Zoölogy* (with W. A. Haswell, 1897). The last named is the guide followed in the classification of animals in this Encyclopædia. Professor Parker died at Warrington, New Zealand, November 7, 1898.

PARKER, Willard (1800-84). An American surgeon, born at Lyndeborough, N. H. He graduated from Harvard in 1826, and from its medical school in 1830, when he was made professor of anatomy in Vermont Medical College, and in the same year professor of anatomy in the Berkshire Medical College, in which latter institution he became professor of surgery in 1833. The following year was spent in the hospitals of London and Paris; and upon his return he was appointed professor of surgery at the College of Physicians and Surgeons in New York City, a post he occupied for thirty years. He then became professor of clinical surgery. In 1854 he first described and reported cases of what is now known as malignant pustule. In 1865 he was made president of the New York State Inebriate Asylum at Binghamton, and in 1867 a member of the Metropolitan Board of Health. He was the first to point out the phenomenon of concussion of the nerves, as distinguished from that of the nerve centres, a condition which had previously been confounded with congestion or inflammation. Dr. Parker made several important discoveries in practical surgery, among which were the operation of cystotomy for the relief of certain cases of chronic cystitis, and that for the cure of abscess near the vermiform appendix, called at that time perityphlitis. He was also a successful operator in many important cases of ligature of the larger arteries. Consult his biography in *Medical Record*, xxv. 492 (New York, 1884).

PARKER, Sir William (1781-1866). An English admiral, born at Almington Hall, Staffordshire. He went to sea when twelve years old on the *Orion*, which shared in Lord Howe's victorious engagement with the French fleet in 1794. As commander of the *Amazon* he was engaged in arduous service on the Portuguese and Spanish coasts and made a notable capture of the French frigate *Belle Poule* (1806). He was made a rear-admiral in 1830, and was knighted in 1834 for his services aboard the flagship *Asia* during the three preceding years. He remained in England as an Admiralty lord until 1841, when he was made vice-admiral in command in the East Indies, and his prompt action in capturing the ports and blockading the mouth of the Grand Canal brought the Chinese war to an end.

In 1845-52 he was commander-in-chief in the Mediterranean, and in 1857 he retired. He was created admiral of the fleet in 1863.

PARKER, William Kitchen (1823-90). An English naturalist and morphologist, born at Dogsthorpe, near Peterborough. He studied medicine at King's College, London, and began to practice in 1849. In 1873 he was appointed Hunterian professor in the Royal College of Surgeons, conjointly with Prof. W. H. Flower. His chief and most suggestive work was on the comparative osteology of the higher vertebrates, from amphibian to mammal. He constantly dwelt on the developmental side and on the phylogeny of the vertebrates, making many improvements in the classification of the types he studied. His larger monographs were: *Monograph on the Structure and Development of the Shoulder-Girdle and Sternum in the Vertebrata* (1868), and memoirs on the skull of the Batrachia (1878 and 1880), the urodelous Amphibia (1877), the common snake (1878), sturgeon (1882), Lepidosteus (1882), Edentata (1886), Insectivora (1886), and an elaborate paper on the development of the wing of the common fowl (1869). His general works were *Morphology of the Skull* (1877) and *On Mammalian Descent* (1885).

PAR'KERSBURG. A city and the county-seat of Wood County, W. Va., 98 miles southwest of Wheeling, on the Ohio River, at the mouth of the Little Kanawha, and on the Baltimore and Ohio, the Baltimore and Ohio Southwestern, and the Ohio River railroads (Map: West Virginia, C 2). It is regularly laid out with a gradual rise from the water's edge, the limits of the city extending for some distance on both rivers. A railroad bridge spans the Ohio at this point, one and one-third miles long, and another spans the Kanawha, both being imposing examples of engineering. The city has a fine public park, public library, Washington High School, Academy of the Visitation, Federal building, court house, and city hall. Blennerhasset Island, of historic interest, is in sight of the city. There are regular steamboat lines to important river ports. The city is favorably located in the centre of a fertile agricultural region, and has an active trade. There are several noted medicinal springs near the city, petroleum and gas wells, and coal and clay deposits of great value. The industrial interests are extensive. There are lumber mills, iron foundries, machine shops, furniture and chair factories, oil refineries, veneer and panel works, breweries, oil-well supply works, flouring mills, etc. Settled in 1773, Parkersburg was first incorporated in 1820, and in 1863 was chartered as a city. Under a charter of 1893, the government is vested in a mayor, chosen biennially, and a council which elects the majority of administrative officials. The waterworks are owned and operated by the municipality. Population, in 1890, 8408; in 1900, 11,703.

PARKES, pärks, Sir Harry Smith (1828-85). A British diplomatist, born in the Parish of Bloxwich, near Walsall, in Staffordshire, England. Left an orphan in tender years, he was educated at King Edward's Grammar School, Birmingham. In 1841 he went to Macao, China. By his energy and diligence he rose to be British Consul at Canton. On October 8, 1856, the Chinese seized the British ship *Arrow*, taking therefrom twelve Chinese sailors. Parkes's vigorous protest and Mandarin Yeh's defiant refusal to make amends led, in December, 1857, to the bombardment and occupation of Canton by the British forces, who were aided by French. In July, 1860, Parkes joined Lord Elgin in the Anglo-French punitive expedition to North China. After the capture of Tientsin, August 24th, Parkes, with twenty-five men, proceeding to Tung Chow under a flag of truce, was captured and imprisoned. Though suffering torture, he sent word to his chief to make no delay or compromise, and to take no account of him. The Allies arrived in Peking October 6th, and half of the prisoners—those not already murdered or starved—were delivered up October 20th; but, in punishment of the Government's treachery, the Emperor's summer palace was pillaged and destroyed. Parkes was knighted in 1862, became Consul at Shanghai, and in 1865 was appointed British Minister to Japan. For eighteen years in this office, he enjoyed extraordinary popularity with his countrymen, and was always a stalwart upholder of British interests. He was a powerful element in the modern history of Japan, fearless, truthful, and a despiser of the shams and hypocrisies which marked the old school of Japanese statesmanship. In 1882 he was made G. C. M. G. He was appointed Minister to China in 1883 to succeed Sir Thomas F. Wade, and in the following year he also became Minister to Korea. He visited Seoul and negotiated a treaty there; but after the Tongking question and diplomacy, in which "he tired out the Tsung li Yamen" (q.v.), he died of overwork, March 22, 1885. He was buried at Whitechurch in England. A marble bust of Parkes was unveiled in 1887 by Sir Rutherford Alcock in Saint Paul's Cathedral in London, and in April, 1890, his was the first public statue unveiled in Shanghai. See his *Life*, by Stanley Lane Poole (London, 1894), and the *Dictionary of National Biography*.

PARKES, Sir Henry (1815-96). An Australian statesman. He was born at Stoneleigh, in Warwickshire, England; was compelled by his father's poverty to earn his own living from the time he was eight years old, and was entirely self-educated. When twenty-four years old, he emigrated to Australia, and opened a little store in Sydney, New South Wales. He attracted some attention as a writer of verses, and gained considerable influence by his writings on economic subjects. In 1840 he founded the *Empire*, a liberal newspaper. Parkes became a zealous advocate of responsible government in New South Wales and of the larger question of an Australian federation. This last was the great work of his life. Upon the establishment of responsible government in 1858, he was elected to the New South Wales Parliament, and was re-elected in 1863. In 1866-68 he was a member of Sir James Martin's Ministry as Colonial Secretary; in 1872 he became Prime Minister, an office which he held again four times during the following years, and in 1891 he presided over the convention which made Australian federation a surety. The most important of his books are: *Australian Views of England* (1869); *Federal Government for Australia* (1890); *Fifty Years in the Making of Australian History* (his autobiography, 1892); and *An Emigrant's Home Letters* (1896). Consult Lyne, *Life of Sir Henry Parkes* (1896).

PARK'HURST, Charles Henry (1842—). An American clergyman. He was born at Framingham, Mass., and graduated from Amherst College in 1866. In 1872 he went to Europe and devoted two years to study at Leipzig, Halle, and Bonn. In 1874 he became pastor of the Congregational Church at Lenox, Mass., and in 1880 was called to the Madison Square Presbyterian Church, New York City. As a preacher he is rapid, nervous, and effective, dealing much in epigram, intensely practical, and fearless in utterance. In 1891 he was made president of the Society for the Prevention of Crime, and the investigations made by the society into the conditions of vice existing under police protection resulted in the appointment by the Senate, on January 30, 1894, of the Lexow Committee to investigate the police department; the work of this committee sustained the accusations brought by Dr. Parkhurst and his society. He has been a frequent contributor to the periodical press, and has published: *Forms of the Latin Verb Illustrated by the Sanskrit* (1870); *The Blind Man's Creed, and Other Sermons* (1883); *Pattern in the Mount and Other Sermons* (1885); *The Question of the Hour* (1896); *The Fellowship of Suffering* (1891); *Our Fight with Tammany* (1895); *Talks to Young Men* (1897); *Talks to Young Women* (1897); *Guarding the Cross with Krupp Guns* (1900).

PARKHURST, John (1728-97). An English Bible scholar. He was educated at Rugby and Clare Hall, Cambridge, and took orders, but received no preferment, spending his life in retirement and study. He published a *Hebrew and English Lexicon* (1762), to which he added in later editions a Hebrew grammar and a Chaldee grammar; a *Greek and English Lexicon to the New Testament*, with a Greek grammar (1769); and treatises against Wesley's doctrine of assurance (1753), and Priestley's views concerning the divinity and preëxistence of Jesus Christ (1787). Parkhurst's lexicons had much merit, but were marred by fantastic theories which he adopted from John Hutchinson. The edition of his Hebrew lexicon published in 1823 contains his life.

PAR'KIN, George Robert (1846—). A Canadian educator and author. He was born in New Brunswick, and was educated at the University of New Brunswick, and later at Oxford University, England. He was principal of the College School at Fredericton for several years, and began to take an active interest in the 'Imperial federation' question, upon which subject he spoke in various parts of the Empire. In 1895 he was appointed principal of Upper Canada College, Toronto. Afterwards he was made one of the trustees to arrange for the scholarships at Oxford provided for by the will of Cecil Rhodes. His publications include: *Imperial Federation* (1892); *Round the Empire* (1892); and *The Great Dominion* (1895).

PARK'INSO'NIA (Neo-Lat., named in honor of John Parkinson, an English botanist of the seventeenth century). A genus of plants of the natural order Leguminosæ. *Parkinsonia aculeata* is a West Indian, Texas, and California shrub or small spiny tree with pinnated leaves, and large yellow flowers spotted with red. When in flower it is one of the most splendid objects in the vegetable kingdom. It is often used for hedges, hence its name Barbadoes flower fence. The bark yields a beautiful, white, short but rather weak fibre, which might be used for paper-making. *Parkinsonia microphylla* and *Parkinsonia Torreyana*, both commonly known as Palo Verde tree or green-barked acacias, are small trees from western Texas to California and south to Mexico.

PARKINSON'S DISEASE. See Paralysis Agitans.

PARK'MAN, Francis (1823-93). A distinguished American historian, born in Boston, September 16, 1823. He graduated at Harvard in 1844, and then studied law for two years in the Harvard Law School, but never practiced. Having become interested in American history, he selected, as his life work, the writing of the story of the rise, decline, and fall of the French power in America. With this thought in mind, he at once began to prepare himself for his great task. In his vacations he visited historic scenes connected with the struggle between the French and the English, and made a study of several Indian tribes yet remaining in New England, New York, and Southern Canada. In 1846, feeling the need of seeing Indians who were still in an entirely primitive state, he traveled westward with a friend, and in company with a tribe of Dakotas spent several months in the Black Hills, in the Platte River country, and on the eastern slopes of the Rocky Mountains. An account of this expedition appeared the next year in *The Knickerbocker Magazine*, under title of "The Oregon Trail," and was republished two years later in book form as *California and the Oregon Trail*.

The hardships he endured while in the West resulted in the breaking down of his health, and he remained a semi-invalid all the rest of his life. Despite this misfortune, he continued in his work, and succeeded, in 1851, in bringing out the first of his historical works, *The Conspiracy of Pontiac* (2 vols.). Fourteen years elapsed before he was able to complete a second. A part of this period he devoted to collecting material, both in America and in Europe, and to writing a novel, *Vassall Morton*, which appeared in 1856, but which met with little success. During much of the time, however, his health was so bad that he was forced to abstain almost entirely from literary work. To occupy his time, he interested himself in horticulture, and acquired such a knowledge of the subject that in 1886 he published *The Book of Roses*, and in 1871 was made professor of horticulture in the Harvard Agricultural School. This position, however, he resigned in the following year. In 1865 the second of his historical works, *Pioneers of France in the New World*, appeared. It was followed in 1867 by *The Jesuits in North America*; in 1869 by *La Salle and the Discovery of the Great West*; in 1874 by *The Old Régime in Canada*; in 1877 by *Count Frontenac and New France Under Louis XIV.*; in 1884 by *Montcalm and Wolfe* (2 vols.); and in 1892 by *A Half-Century of Conflict* (2 vols.), which completed the series. Besides these works, he published also an *Historic Handbook of the Northern Tour* (1885), and numerous articles, many of them advance chapters from his histories, in magazines and other periodicals. During all this time his health continued to be precarious, and his eyes were so weak that his material, collected for him

by hired copyists, had to be read to him, and he was forced to rely almost entirely upon dictation instead of the pen. The story of his struggle against such odds is one of the most heroic in the history of literature. He died at his home at Jamaica Plain, Mass., November 8, 1893, the year following the completion of his great work.

Authorities are unanimously agreed that to Parkman belongs a place with such historians as Bancroft, Prescott, and Motley, and many are of the opinion that his work will live longer than any other yet done in the field of history on this side of the Atlantic. In him, in fact, existed a combination rare among historians: for while he was a scholarly and indefatigable investigator, he was at the same time a consummate literary artist. His search for material was one of the most exhaustive that any historian has ever made. He seven times visited Europe, and while there sought out the documents bearing upon the period about which he intended to write. He visited also all the important localities mentioned in his story, and his knowledge of the Indians and of the wild life of the woods was invaluable in giving him insight into the events he narrated. Consult Farnham, *A Life of Francis Parkman* (Boston, 1901).

PARKS AND PLAYGROUNDS. The term park is here used to denote a tract of ground set apart for public use and enjoyment. A grassy expanse, large or small, stocked with shade trees, and used for rest and recreation, is a park, whether it be as formal as at Versailles, as wild and picturesque as Fontainebleau, or as trim as an old Dutch garden. Even grass may be omitted and yet the park remains, as in the park of the Tuileries in Paris, where the entire surface among its trees not occupied by pavements, groups of shrubs, or parterres of flowers, is covered with loose gravel, through which water percolates to the tree roots, and over which there is no restraint of popular use. The distinction between a park and a pleasure garden is this: the decorated garden where no crop is grown is cultivated to exhibit a growth of grass, trees, shrubs, or flowers with reference to the special beauty of each, as well as the beauty of harmonious arrangements. The perfectness of development of each part of a pleasure garden is the object aimed at. (See LANDSCAPE GARDENING.) The garden becomes a park whenever freely used for recreation by persons not interested in its special growth. Frederick Law Olmsted, the highest American authority on parks, suggests that small open spaces in cities, designed for public use, should be called places when not large enough to have grass and trees, and place-parks when barely large enough to have grass-plats and a few trees; that thoroughfares planted with trees for special adaptation to promenades, or as avenues to parks, should be called parkways; and public forests without roads simply woods.

The practice of reserving public parks for the use and delight of the people seems to be as old as civilization. The Egyptians had parks from the earliest times. These were small and formal, ornamented with colonnades and other architectural features, and with sculpture. Very different were the parks of the Assyrians and later Persians, who reserved and lavishly decorated vast areas of mountain land. Little is known of the parks of the Greeks, but they were probably limited and formal, like those of the Egyptians. In Rome, however, in the time of the Cæsars there were, according to Lanciani, eight camps or commons and thirty parks belonging to the city. Of these the most extensive was the Campus Martius. During the Middle Ages public parks were little thought of, but the Renaissance is notable for the beautiful public gardens and parks which were then laid out and which are still the ornament of many European cities.

Another condition has favored the existence of accessible parks in European cities: Nearly every town formerly had its wall and surrounding ditches and reserve of open ground outside kept clear for military defense, all belonging to the State. These walls and adjacent grounds, before as well as after the fortifications were razed, were the promenades of the people, and in modern times have been converted into parks and boulevards. Towns which have grown greatly have had several successive circles of inclosing fortifications, thus providing, as in Paris and Vienna, several successive circles of public promenades, boulevards, and commons.

The area of parks in London is proportioned to the immensity of the city. Only a small part of them is broken by carriage roads, nearly their whole extent being dedicated to the exclusive use of pedestrians. Its seven great parks are: Hyde, containing about 400 acres, intersected by walks and carriage roads (including the famous saddle-horse road called Rotten Row), clothed with old forests, and graced by the lake called Serpentine; Kensington Gardens, an adjoining royal park of about the same size, farther from the city; Green, a smaller pedestrian park, by which Hyde Park may be approached; Regent's, nearly circular, with 450 acres, and having zoological and botanic gardens; Victoria Park, with 290 acres; Battersea Park, 320 acres; Kensington Park, 20 acres. These are almost exclusively for pedestrians, as well as the great Botanic Gardens of Kew outside of London. Paris is more noted for the elegance and great number of its place-parks and avenues for promenades than for real parks. The latter have become numerous of late years, and are even more recent than the Central Park of New York. The Bois de Boulogne, an ancient wood belonging to the Crown, was given to the public about 1852. It contains 2,250 acres, not particularly interesting by nature, with no noble trees, but treated with all the graces of art possible to cover its natural deficiencies. Carriage drives and promenades traverse it in every part, and four artificial lakes are its most interesting feature. The most striking new park in the city is the Buttes Chaumont, in the quarter occupying the site of extensive old stone quarries. The Park Monceau is a smaller example of similar transformation. The old gardens of the Tuileries, already alluded to, and the gardens of the Luxembourg, though more like gardens than parks in their treatment, are so completely used by the public that they fulfill all the uses of parks. Paris is provided with park resorts outside of the city to a greater extent than any other city. All the old château forests and hunting grounds of successive kings of France are now the property of the State and furnish attractions in every direction from the city. Saint Cloud, Versailles, Vincennes, and Fontainebleau, the last named one of the most picturesque and extensive of old royal hunting forests,

are the most noted. Smaller cities in France and throughout Europe abound in beautiful small parks contiguous to their population, most of which have been improvements of the last thirty years, made possible by the possession by municipalities of suitable ground previously used by the public, but not specially improved for their enjoyment.

Public parks in the United States on a small scale are as old as the cities. A seaside walk was originally the most common. The Battery in New York, and the Bay Side in Charleston, S. C., are familiar examples. The City Hall Park in New York was originally a playground or common. Boston Common was specifically dedicated to public use by the founders of the city, and has more perfectly fulfilled its use than any other equal area in the country. Public squares in nearly all the cities, notably around Yale College in New Haven, have shown the noble expression that may be given to a very limited park by avenues of full-grown native trees. The period of land speculation from 1830 to 1837, when great numbers of Western cities were planted, was peculiarly unfortunate in the failure to dedicate ground liberally either in park-places, public squares, or larger grounds. Many of the so-called 'boom' cities which have since been planted farther west have provided for parks and other public grounds in a most liberal manner. The beginning of the era of public parks for large cities, commensurate with their size, was made when the city of New York secured special legislation to create the Central Park. Though inferior in many respects to older parks, especially if its comparatively recent growth of trees be compared with noble old park forests, and its limited ranges of lawn with the great expanse of the finest English parks, yet it has this merit in a remarkable degree that, in proportion to the ground which it covers, the loss of space by the great reservoir being considered as well as its proportions and topography, it has developed more beauties and interest for public use than any other. The property was secured in 1857, and the plans for its laying out submitted by Frederick Law Olmsted and Calvert Vaux were adopted and put in their charge to be executed. The ground occupied is two and a half miles long north and south, and a half-mile wide east and west. The city reservoirs within it occupy 142 acres, forming a lake, the elevation of which does not permit it to be given the air of a natural piece of water, but which nevertheless is a pleasing feature. Besides this water there are several artificial lakes. Exclusive of the reservoirs and building sites, the park contains 683 acres. About 110 acres are in lawn, little broken by rocks and only bordered by trees, and the remainder mostly broken ground, in glades and young forests, or covered with copses and shrubbery, but nearly all in a condition to have a surface lawn. The grand terrace by Mr. Vaux—the first great work of park architecture executed in the United States—is an admirable study. Prospect Park, in the Borough of Brooklyn, is an outgrowth of the enthusiasm developed by the creation of the Central Park. It contains 550 acres, all of which is available for park use. Well-grown trees already on a part of it, and larger stretches of grassy ground, gave a nobler immediate effect in sylvan features than was possible in Central Park. Its architectural features, though on a grand scale, are not so interesting as those of Central Park, except at the entrance, which is finer. The heights command a fine view of New York Bay and the ocean, and there are picturesque artificial lakes.

Philadelphia, in addition to her generous original squares for park use, followed and outdid New York in the purchase and improvement of Fairmount Park. Its extent, varied surface, fine old trees, broad expanses of turf, the Schuylkill River at its side, and the stream of the Wissahickon, flowing through a picturesque rocky valley clothed with the trees, shrubs, and wild vines of virgin nature, through dark dells, broken by numerous waterfalls, altogether give it a different character from that of most other parks of the United States. Baltimore has the honor of the noblest forest park of the United States, Druid Hill—an old forest of 700 acres acquired in 1860, previously the private park of an old estate. Most of the larger and many of the smaller American cities have followed the example of New York and Philadelphia in providing liberal park areas.

Playgrounds. Recently there has been an effort to secure public playgrounds for city children. When children have no playgrounds but the streets they will necessarily be interfered with in their games by the police, and thus a most unfortunate spirit of antagonism toward the guardians of the peace is engendered. Not only the moral and physical value of playgrounds, but also their educational value, is beginning to be understood by those who have the welfare of the children at heart. The forerunner of the playground was the New England 'common,' where the boys met to play that peculiarly American game, baseball. It is not surprising, therefore, that the New England city of Boston leads in the provision of children's playgrounds. At the close of 1901 Boston had 14 grounds ranging in size from 0.4 acre to 77 acres, and making a total area of 182 acres. Brooklyn has maintained for years a fine though inaccessible playground. In 1898 Milwaukee established an open-air gymnasium in one of its parks. In the city of New York, portions of Central Park have for years been set apart as children's playgrounds. A general movement for the establishment of municipal playgrounds throughout the city, and especially in the congested tenement-house district, was inaugurated in 1887. In that year an act was passed by the State Legislature permitting an annual expenditure of $1,000,000 for the establishment of small parks. The City Park Department, however, has steadily opposed the use of any portion of this sum for the foundation and equipment of children's playgrounds. In May, 1888, the New York Society for Parks and Playgrounds for Children was incorporated under a special law giving the society unusual powers, including the appointment of special police. In 1894 the Tenement-House Commission secured the adoption of a law which provides for at least two parks on the lower East Side "to be furnished in part as public playgrounds." The first of these plots was opened to the children in 1900. It was merely a bare piece of ground with no apparatus for children's games and no directors. Under such management it has done little good. The management of the second of these plots, known as Seward Park, was assumed by the Recreation League, an organiza-

tion devoted to work of this character; apparatus was obtained and directors secured to help the children in their games, the entire cost of equipping and operating the playground being paid by the League. The playground was opened to the public on June 3, 1899, in the presence of from 15,000 to 30,000 people. From the start it has been immensely popular with the children, and is an effectual proof of the feasibility and usefulness of such undertakings. In 1903 various other parks were opened as playgrounds.

Another branch of the work of furnishing playgrounds for the children of New York was undertaken in 1898. In that year the school boards of Manhattan and the Bronx appointed a committee for the management of summer playgrounds and appropriated $15,000 for the work. On July 6th twenty playgrounds attached to public schools were opened. Apparatus for games and gymnastics were supplied the children and a director was appointed to take charge of each playground. The daily attendance in the playgrounds averaged from 300 to 1000 children, and many had to be turned away.

The work of securing playgrounds for the children is not confined to the few large cities mentioned. According to Baker, *Municipal Year-Book* (New York, 1902), 187 cities and towns in the United States reported municipal playgrounds in 1901. Of these, 51 were in New England, 39 in the Middle Atlantic States, 11 in the South Atlantic, 13 in the South Central, 41 in the North Central, 16 in the Northwestern, 9 in the Southwestern, and 7 in the Pacific States. According to the same authority 747 cities and towns of the United States reported the possession of municipal parks.

Recreation Piers. Another form of [illegible] enjoyment has been provided by several American cities in the [illegible] recreation [illegible]. These are simply second stories to the ordinary shipping piers, fitted up with canopy roofs; [illegible] open day and evening; music is furnished at certain hours, and dancing allowed.

With the advent of the trolley and the bicycle, the outskirts of cities have become more accessible to the inhabitants, so that parks many miles distant may be reached in a comparatively short time and for a trifling sum. Many of the trolley companies have themselves taken advantage of this fact and have fitted up parks on their lines for the sake of the traffic which they attract. At the close of the last century the description of more than one hundred such parks could be found in recent numbers of the street railway journals. The movement for park sys-

CITIES	June, 1900, Population	Area of city in acres	Area of parks [illegible]	Area of parks [illegible]	Percentage of [illegible]*
New York, N. Y.	[illegible]7,202	[illegible]	[illegible]	[illegible]	4
Chicago, Ill.	[illegible]	122,240	[illegible]		7
Philadelphia, Pa.	[illegible]	[illegible]	4,044	[illegible]	[illegible]
Saint Louis, Mo.	575,238	39,277	2,177		[illegible]
Boston, Mass.	560,892	[illegible]	2,618	.....	[illegible]
Baltimore, Md.	508,957	24,172	[illegible]	4	4.7
Cleveland, Ohio	[illegible]	[illegible]	[illegible]		[illegible]
Buffalo, N. Y.	[illegible]	[illegible]	[illegible]		[illegible]
San Francisco, Cal.	[illegible]	[illegible]	[illegible]		[illegible]
Cincinnati, Ohio	[illegible]	[illegible]	[illegible]		[illegible]
Pittsburg, Pa.	[illegible]	[illegible]	[illegible]		4.5
New Orleans, La.	[illegible]	[illegible]	[illegible]	250	[illegible]
Detroit, Mich.	[illegible]	[illegible]	[illegible]		[illegible]
Milwaukee, Wis.	[illegible]	[illegible]	[illegible]		[illegible]
Washington, D. C.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Newark, N. J.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Jersey City, N. J.	[illegible]	[illegible]	[illegible]		[illegible]
Louisville, Ky.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Minneapolis, Minn.	[illegible]	[illegible]	[illegible]		[illegible]
Providence, R. I.	[illegible]	[illegible]	[illegible]		[illegible]
Indianapolis, Ind.	[illegible]	[illegible]	[illegible]	24	[illegible]
Kansas City, Mo.	[illegible]	[illegible]	[illegible]		[illegible]
Saint Paul, Minn.	[illegible]	[illegible]	[illegible]		[illegible]
Rochester, N. Y.	[illegible]	[illegible]	[illegible]		[illegible]
Denver, Colo.	[illegible]	[illegible]			[illegible]
Toledo, Ohio	[illegible]	[illegible]	[illegible]		[illegible]
Allegheny, Pa.	[illegible]	[illegible]			[illegible]
Columbus, Ohio	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Worcester, Mass.	[illegible]	[illegible]	[illegible]		[illegible]
Syracuse, N. Y.	[illegible]	[illegible]	[illegible]		[illegible]
New Haven, Conn.	[illegible]	[illegible]	[illegible]		[illegible]
Paterson, N. J.	[illegible]	[illegible]	[illegible]		[illegible]
Fall River, Mass.	[illegible]	[illegible]	[illegible]		[illegible]
Saint Joseph, Mo.	[illegible]	[illegible]	[illegible]		[illegible]
Omaha, Neb.	[illegible]	[illegible]	[illegible]		[illegible]
Los Angeles, Cal.	[illegible]	[illegible]	[illegible]		[illegible]
Memphis, Tenn.	[illegible]	[illegible]	[illegible]		[illegible]
Scranton, Pa.	[illegible]	[illegible]	[illegible]		[illegible]
Lowell, Mass.	[illegible]	[illegible]	[illegible]		[illegible]
Albany, N. Y.	[illegible]	[illegible]	[illegible]		[illegible]
Cambridge, Mass.	[illegible]	[illegible]	[illegible]		[illegible]
Portland, Ore.	[illegible]	[illegible]	[illegible]		[illegible]
Atlanta, Ga.	[illegible]	[illegible]	[illegible]		[illegible]
Grand Rapids, Mich.	[illegible]	[illegible]	[illegible]		[illegible]
Dayton, Ohio	[illegible]	[illegible]	[illegible]	9	[illegible]
Richmond, Va.	[illegible]	[illegible]	[illegible]		[illegible]
Nashville, Tenn.	[illegible]	[illegible]	[illegible]	25	[illegible]
Seattle, Wash.	[illegible]	[illegible]	513	14	[illegible]
Hartford, Conn.	[illegible]	[illegible]	186		[illegible]
Reading, Pa.	[illegible]	[illegible]	[illegible]		[illegible]

*Regardless [illegible]

tems on an extensive scale is progressing in the United States, and two such systems are being developed at public expense with considerable success, one in the region about Boston, and the other in Essex County, N. J. At the beginning of 1902 the Metropolitan Park System for Boston and vicinity included 9248 acres of parks and 23.6 miles of parkways, and an immense ocean-bathing establishment. Besides this large area in parks and public reservation, the city of Boston alone had 2389 acres in parks and playgrounds, and hundreds of acres of parks were owned by the other cities and towns in the park district. In 1902 the Essex County Park System included 3548 acres of land, with a comparatively short length of parkways built, but many miles projected. Much of this land lies along the ridge of the Orange Mountain, commanding a view of New York City and Harbor and the intervening country. A feature of these two park systems is the providing of large reservations, to be left as nearly as possible in their natural state.

The preceding table gives the population, area devoted to parks, and the percentage of the total area which is in parks, for the 50 largest cities in America. The table was compiled from the *Bulletin* of the United States Department of Labor for September, 1900, and the column of percentages has been added. It will be seen that Columbus, Ohio, has the largest percentage of its area devoted to parks. It must be remembered, however, that two factors enter into this proportion, and that where a city has a great area in proportion to its population, like Saint Paul, the need for public parks is not so great as in a densely crowded city like Jersey City. The latter city, crowded as it is, is one of the most poorly provided with parks of the cities of the United States.

PARLEMENT. The name borne in France, before the Revolution, by a number of local tribunals which exercised a great influence on the government in fields other than the judicial. The Parlement of Paris, the most influential and celebrated of the French parlements, is generally supposed to have had its origin in the *curia regis* of the Frankish kings, an assembly consisting of the lay and ecclesiastical dignitaries of the court which met under the presidency of the king or his representative and exercised a wide though undefined jurisdiction, equitable in nature. Broadly speaking, its powers extended to all cases involving the royal interest, but it also heard appeals from inferior courts where delay or denial of justice was concerned. Under the Carolingian monarchs it became the court for the trial of cases involving the high nobility, and its jurisdiction was also extended over all persons living under the royal protection. In the course of time the *curia regis* fell apart into three separate bodies: the *conseil du roi*, the *chambre des comptes*, and the Parlement proper, which name first prominently appears under St. Louis. Under Philip the Fair the légistes or members of the learned bourgeoisie began to enter the Parlement which up till then had been composed exclusively of the lay and ecclesiastical nobility. These came to constitute a very important element in the body, as is indicated by an ordinance of 1296, which ordered that 18 laics and 16 clerks should always be in session for the doing of judicial business. The Parlement at this time comprised three chambers: the *grand' chambre* or full Parlement, meeting for the rendering of decrees; the *chambre des enquêtes*, to which was referred the greater mass of detailed work, such as preliminary investigation and the sitting of testimony, and the *chambre des requêtes*, which received the petitions of those desiring to come within the jurisdiction of the Parlement. From 1417 to 1436, while Paris was in the hands of the English, the Parlement was in session at Poitiers. In 1467 the irremovability of members of Parlement was established. The method of admission at this time was by royal appointment from a list submitted by the Parlement, but frequently the kings exercised the power of direct appointment. Under Francis I. the principle of purchase became general; nominations henceforth ceased and membership, as a rule, passed from father to son, resulting in the establishment of a so-called nobility of the robe, fully as class-conscious, as jealous of its prerogatives, and as careful of furthering its interests, as was the feudal nobility. The salary was slight, and the chief income of the magistrates was derived from fees which were very high. The kings at various times sought to increase their revenue from the sale of offices by increasing the number of members of Parlement, or even the number of chambers, there being at one time no less than nine of these in the Parlement of Paris. In 1604 the so-called Paulette was introduced in accordance with which members of Parlement paid an annual fee of 1-60 of their income in return for which their office, on death, passed to their heirs.

The provincial parlements had their rise after the Hundred Years' War. As the great feuds were reunited with the crown, parlements were established in the local capitals to perform the same judicial functions as the Parlement of Paris did within its jurisdiction. The Parlement of Toulouse had been established in 1302, but was dissolved after some time, and was not reëstablished till 1443. The other local parlements, with the date of their foundation, were as follows: Grenoble, 1461; Bordeaux, 1462; Dijon, 1477; Aix, 1501; Rouen, 1515; Rennes, 1553; Pau, 1620; Metz, 1633; Besançon, 1676; Douai, 1686; Trévoux, 1762; Nancy, 1775. The early theory was that all the parlements constituted but one body, and that the members of one parlement were entitled to sit in any other. This, however, was not maintained for a long time. The parlements were all on a basis of equality in that each was supreme within its jurisdiction, but a certain predominance was enjoyed by the Parlement of Paris, whose decrees, after 1474, were binding in any part of the kingdom without the *visa* or confirmation of the local parlement. For the facilitation of business the Parlement frequently sent out a number of its members to hold court in different places. These were known as Grand Jours and constituted, practically, courts of assize.

The political importance of the Parlement of Paris dates from the reign of Charles VI. Under Louis XI. it began definitely to put itself into opposition to the royal will in matters of legislation and administration by attempting to modify the text of the royal edicts submitted to it for registration (*enregistrement*) or by rejecting them altogether. The process of registration, which

in the beginning was merely formal and largely in the nature of an act of record, had come in time to be regarded by the Parlement as essential for the validity of all royal decrees. The kings met the opposition by letters of "jussion" commanding the Parlement to register, frequently, too, by imprisonment and exile. After 1563 the common form was by means of a royal bed of justice (q.v.), where the king appeared in solemn state and ordered the Parlement to register the obnoxious decree. The Parlements exercised great influence during the period of the civil wars when they were the strongholds of catholicism. They submitted, however, to Henry IV. The Parlement of Paris sought to assert its authority during the reign of Louis XIII., but failed before the masterful will of Richelieu. Under Louis XIV. Parlement, after playing a leading part in the troubles of the Fronde (q.v.), was restricted entirely to its judicial functions. After that monarch's death, however, the Parlement declared his will invalid, and vested the regency in the Duke of Orleans. Thereafter it was engaged in continuous struggles against the crown in the hope of regaining its former power. It was conspicuous in the Jansenist controversy in connection with the Bull Unigenitus (see JANSENISM), and was the bitter enemy of the Jesuits, whose expulsion it brought about with the aid of Madame de Pompadour. The conflict between the Parlement and the crown culminated in the coup d'état of 1771, when the Chancelor Maupeou declared all the offices of the Parlement vacant and organized a new body whose authority was greatly curtailed by the establishment of six superior courts in the territory formerly under the jurisdiction of the Parlement. Purchase and fees were abolished, but the principle of irremovability was retained. In spite of the fact that the change was on the whole for good, the new Parlement—the Parlement Maupeou, as it was called—was extremely unpopular, and when Louis XVI. succeeded to the throne he restored the old magistrates. The quarrels with the crown nevertheless continued, the Parlement making itself the mouthpiece of the new ideas of popular rights, national sovereignty, and thorough-going reform. Its protestations, however, were not sincere, as was evidenced at the summoning of the States-General, in 1787, when it showed itself no less jealous of its prerogatives than the nobility or the clergy. It lost thereby the popularity which it had enjoyed for some time, and in 1790 the Parlement of Paris, with the provincial parlements, was abolished by the National Assembly. As judicial tribunals the French parlements take a very high position among such institutions in history. Though narrow in spirit as far as concerned their privileges as a caste, they nevertheless dispensed justice in an admirable manner, and were largely instrumental in unifying the customary law of France. Consult Voltaire, *Histoire du parlement de Paris* (Paris, 1769); Dufey, *Histoire, actes et remontrances des parlements* (vol. ii., Paris, 1826); Flammermont, *Le chancelier Maupeou et les parlements* (Paris, 1883).

PARLER, pär'lēr, PETER (*c.*1333-*c.*1307). The most famous and successful of a family of German architects. He was born in Gmünd and his name seems to have been corrupted in Bohemia from Arler to Parler, possibly under the influence of *Parlierer* or *Polier*, a word used in the architecture of the Middle Ages, signifying 'foreman.' Like his father, Heinrich, he got his early training in Cologne. In 1356 he was architect on the Prague Cathedral, of which he built the choir. His brother, JOHANNES, became master architect of the Cathedral of Freiburg in 1359. Some members of the family were known by the name of Von Gmünd. All are classified by Klemm in the *Allgemeine deutsche Biographie*. Consult Neu with, *Peter Parler von Gmünd und seine Familie* (Prague, 1891).

PARLEY (OF. *parler*, turn of speech, from *parler*, to speak, from ML. *parabolare*, to discourse, from Lat. *parabola*, comparison, speech, parable). In military affairs, this term is used to describe the conversation between antagonists, which may be introductory to an exchange of prisoners, burial of dead, or care of wounded soldiers. Hostilities are temporarily suspended in the vicinity near where the parley takes place. A parley is usually preceded by a flag of truce, although it may be preceded by a roll of drums, known as *beating a parley*.

PARLEY, pär'li, PETER. The pseudonym of the American author, Samuel Griswold Goodrich (q.v.).

PARLIAMENT (OF., Fr. *parlement*, discourse, conference, legislature, from *parler*, to speak). The name of the legislative assembly of Great Britain and Ireland. The legislative assemblies of Scotland and of Ireland previous to the union with England (1707) and Great Britain (1801) respectively bore the name of Parliament. This is also the designation of the legislatures of the Dominion of Canada and of the Commonwealth of Australia. The Parliaments (Parlements) which existed in France before the Revolution of 1789 were not legislative, but judicial bodies. The word was first used by Matthew Paris in 1246, but only gradually replaced the terms by which the councils of the English King had previously been known. Moreover, even when so called, Parliament had not at first the privileges and functions which it exercises to-day. Modern Parliament has developed by slow and painful degrees from the Witenagemot of Anglo-Saxon times. This body was composed of princes, prelates, aldermen, and a varying number of royal nominees. It met thrice yearly, had the power of electing and deposing kings, gave consent and assent in all matters of legislation, and was the supreme court of justice for the kingdom. It was in no sense a representative and legislative body, but, as the name indicates, a council of *witan* or wise men, assembled to advise the King. After the Norman Conquest the Witenagemot gradually lost its old significance together with its name, and was merged in the Great Council, an assembly to which in theory every tenant in chief of the King belonged. This was generally attended only by royal officials, the great prelates, earls, and those barons who were individually summoned. The powers of the body were three: it held a somewhat loose control over taxes, it gave consent to laws proposed by the King, and it acted as a court of justice. The first function became of some importance by the end of the twelfth century, when the idea that taxation and representation go hand in hand first germinated

the second was exercised to good purpose in great crises like the conflict between Henry II. and Thomas à Becket; but the third developed earliest and gave the Council its peculiar character.

With the granting of the Great Charter on June 15, 1215, by King John, the national assembly entered upon its chief period of transition. (See MAGNA CHARTA.) The commons, especially the citizens of London, had given important aid to the barons in their struggle, and the latter obtained certain privileges, personal and commercial, for them. More important was the fact that for the first time the nobles and commons were thus united against the Crown. The Great Charter provided that scutage, a form of feudal taxation hitherto exacted at the pleasure of the King, should no longer be levied without the consent of the Great Council, which was to be summoned forty days before the appointed date for meeting, so that all might have time to attend. The document took no notice of the representative principle, however, and the minor barons subsequently regarded themselves as exempt from attendance at the Great Council because they were no longer entitled to summons by special writ. But, curiously enough, John had already recognized the principle of representation in 1213 when he summoned to the Council of Saint Albans the reeve and four men from each vill on the royal demesne. This is the first occasion where all three estates, nobles, clergy, and commons, sat together. Recognition had thus been gained for the ideas of representation, election, and concentration in a central assembly, but until 1254 the experiment seemed abortive. In that year Queen Eleanor and Earl Richard of Cornwall, regents during the absence of Henry III. in Gascony, called a council to meet at Westminster, at which were present two knights chosen from each shire. This element was to be of great importance in the development of Parliament, since the knights of the shire henceforth furnished leaders for the commons, and, many of them being nearly related to the nobles, they enabled the two estates to unite in opposition to the Crown. This was a most important effect of the rule of primogeniture which, contrary to the custom on the Continent, was in strict force in England. The younger sons of the nobility were usually country gentlemen and thus served as a connecting link between the nobles and the commons.

In spite of the part played by the commonalty in these early attempts at constitutional reform, the tendency of the time was oligarchical. This is clearly shown by the struggle between Henry III. and Simon de Montfort (qq.v.). Though in the course of it distinction was first made between the representatives of shires and of boroughs, Simon called upon the commons only to further his ambitious plans, and even then gave them no voice in the formation of his governmental scheme. In 1258 a form of provisional government was ratified, embodied in the Provisions of Oxford (q.v.), which was distinctly oligarchical and altogether unsatisfactory. In 1261 the barons under the leadership of Simon summoned three knights from each shire south of the Trent to the autumn Parliament at Saint Albans to consider the Provisions. The King, not to be outdone, summoned the same knights to Windsor, with the result that neither council was held. Three years later, after the battle of Lewes, Simon gathered his first Parliament, to which somewhat extended powers were granted. It is with the Parliament of Westminster, however, which met in January, 1265, that Simon's name is especially connected. To this assembly were summoned not only two knights from each shire, but also two burgesses or citizens from twenty-one boroughs or cities mentioned by name in the writ. Thus for the first time the third estate, made up of county freeholders and burgesses, was fully represented in a national assembly. Nevertheless, the importance of Montfort's act has been somewhat exaggerated. In the first place, the Parliament was not truly representative. Of the lords, who as a whole were unfavorable to his cause, only five earls and eighteen barons were summoned, while of the clergy, who were his supporters, there was a very disproportionate number. Furthermore, it is doubtful whether the Parliamentary representation of the third estate was intended to be permanent. Yet Simon cleverly adapted existing materials to his own ends and showed the lines on which a real Parliament was to be formed. Meanwhile there was developing on the part of the commons a tendency toward organized opposition to excessive taxation and a somewhat indefinite theory that a grant of supply should receive the consent of Parliament. It was a step in advance that Henry III. recognized the necessity of support from the barons and that both parties no longer ignored the rights of the towns.

To Edward I. belongs the honor of completing the work of founding Parliament. During the first twenty years of his reign, though there was no important advance, he summoned representative assemblies occasionally. Whether consciously or not, he seems to have been experimenting in order to determine the proper representation of the various classes which had crystallized during the struggle of the last reign. In 1294 the right of the clergy to give consent to taxation was formally acknowledged. In the following year Edward was beset with difficulties on account of his wars with Wales and France. He needed money, and accordingly summoned representatives of the three estates, the consent of which had become essential in the matter of taxation. This assembly, which met in November, 1295, is known as the Model Parliament. To it came, aside from the bishops and the abbots, the earls and the barons, two knights from each of 37 shires and representatives of 110 cities and boroughs. The Parliament was held at Westminster, which became from this time the regular meeting place of the assembly. That Parliament was not formed into three chambers rather than into two was due to the attitude of the lower clergy, who soon withdrew and voted grants of money in their own assembly or Convocation. It was not till the reign of Edward III. that the definite separation into two Houses took place. The knights at first vacillated between the lords and the commons, but in 1332 is found the first clear reference to the arrangement which after 1339 was permanent, the lords forming the Upper House, the knights and burgesses the Lower.

If the thirteenth century marks the formation, the fourteenth century is especially notable for the development of the privileges of Parliament.

In 1322 Edward II. definitely acknowledged that "the matters which are to be established for the estate of our lord the King and of his heirs, and for the estate of the realm and of the people, shall be treated, accorded, and established in parliaments by our lord the King, and by the assent of the prelates, earls, and barons, and the commonalty of the realm." Though the position of the lords and commons was thereby recognized, the latter had yet to struggle for actual power. Laws were still made by means of petitions to the King, and only the King could proclaim them. A purely formal survival of this condition explains the phraseology of the laws in our own time, which, according to the stereotyped preamble, always emanate from the Crown, Parliament merely consenting. The Hundred Years' War (q.v.) still further increased the power of Parliament, because of the necessity of appealing to the people to meet the enormous expenses which it entailed upon the Government. The advance in privilege during the period from the accession of Edward II. to the death of Henry V. may be summarized as follows: (1) By the ordinance of 1311, succeeded by the acts of 1330 and 1362, it became the rule to summon Parliaments every year. This provision was often evaded; but regular and frequent assemblies were nevertheless held throughout the fourteenth and fifteenth centuries. (2) From 1340 taxation without the consent of both Houses was illegal. (3) After 1407 the Commons possessed the preponderating voice in making money grants. (4) Parliament began to exercise the right of supervising expenditure, which involved not only the audit of accounts, but also the impeachment of royal officials. This was first done by the Good Parliament (q.v.) in 1376, and constituted an early but important step toward ministerial responsibility.

The Wars of the Roses proved in a manner detrimental to the development of Parliament, since the destruction of the powerful nobles left the commons unaided in their struggles against the Crown. Yet the introduction of legislation by means of bills instead of petitions in the reign of Henry VI. really laid the foundations for the subsequent power of Parliament. During the earlier part of the Tudor period Parliament was denied even the semblance of power, but Thomas Cromwell showed Henry VIII. the way to use it for his own ends while observing the letter of the law. Subsequently the Tudors ruled [illegible] by means of their control over Parliament. The course they followed was this: (1) Occasionally they employed the old device of dispensing with Parliament altogether; but (2) they found a safer method in creating a number of small boroughs, later called [illegible] [illegible] narrowing the right of [illegible] [illegible] cured the nomination of the [illegible] Commons and made the [illegible] member of that body; (4) [illegible] fell back upon the royal [illegible] ment by proclamation. The [illegible] worked toward the same end [illegible] the 27 abbots and priors [illegible] the temporal peers in [illegible] Crown the opportunity of [illegible] by means of new creations [illegible] first temporal peers had been [illegible] in-chief; from the time of J[illegible] barons who received person[illegible]

Great Council; under Edward I. such barons were confirmed in their hereditary rights; but not till the device of creation by letters patent was established did the hereditary peerage in the modern sense appear. Instances of such creations are found as early as the reign of Stephen, but they were rare till the time of Richard II. Since the Reformation the spiritual lords have been [illegible] the [illegible] House of Lords [illegible] to note the peculiar function of the King as a court of last resort, a right which it has kept since the separation of the Privy Council from Parliament in the reign of Richard II.

With the accession of James I. [illegible] in 1603 began the last great struggle between Parliament and the Crown. The Tudors had been able to retain their personal popularity and to rule somewhat despotically because they held to a definite [illegible] power. The Stuarts, in defiance of this, obstinately asserted the principle of divine right, which was peculiarly obnoxious to the Puritan Party that was fast becoming strong. Moreover, James was a foreigner and understood the needs of Scotland better than those of England. The struggle with Parliament continued [illegible] Charles I. (q.v.), resulting in the Great Civil War and the rule of Oliver Cromwell (q.v.). The struggle centred about the right of taxation and the right to impeach royal officials. In both of these contests the House of Commons ultimately won [illegible] also in the [illegible] question of the inviolability of its own members. Though the army was all-powerful during the Protectorate itself, the Restoration found Parliament in possession of the rights for which it had long struggled. The reign of Charles II. was strictly Parliamentary, at least as far as outward forms went, and freedom of speech in Parliament was definitely established. In this reign, moreover, the influence of the Lower House was vastly increased by the provision that bills for the grant of supplies must [illegible] the Lords. With Charles II. also arose the Cabinet [illegible] of ministers [illegible] Parliament [illegible]

the confidence of the nation. The limit was extended to seven years by the Septennial Act of 1716, which is still in force. The eighteenth century is notable for the complete development of the party system, though the Whigs and Tories had existed under these names since 1679. In connection with the rise of parties appeared the completely developed Cabinet government, whereby the Crown is compelled to select its ministers from the dominant party in the House of Commons. The fact that George I. was a foreigner and unable to speak English had much to do with this change in government. George III. (q.v.), indeed, tried to create a party of his own, but failed. Henceforth the maxim that 'the King reigns but does not govern' represents the spirit of the English Constitution. In 1707, by the union of Scotland with England and Wales to form the Kingdom of Great Britain, certain changes were made in the composition of Parliament. Scotland received 45 members in the House of Commons, while its peers were to elect for every Parliament 16 representatives from their number to sit in the Upper House. As the Crown was restrained from creating new peers for Scotland, the Scottish peerage is gradually becoming extinct. In 1800 the Irish Parliament also ceased to have a separate existence, and Ireland was to be represented in the Parliament of Great Britain and Ireland by one of the four archbishops and three of the eighteen bishops sitting by rotation of sessions, by 28 temporal lords elected for life by the Irish peerage, and by 100 members of the House of Commons. The spiritual lords lost their seats in 1870, however, in consequence of the disestablishment of the Irish Church.

In the latter part of the eighteenth century Parliamentary corruption became notoriously prevalent. In 1793 the Duke of Norfolk had eleven seats for rotten boroughs in his gift, and many other wealthy men were answerable for a lesser number. Moreover, many great towns had no representatives whatever in the House of Commons. After various abortive attempts at the reform of Parliamentary representation by the younger William Pitt and others, the question became acute at the close of the Napoleonic wars and did not cease to agitate the kingdom during the greater part of the nineteenth century. Legislative measures began with the great Reform Bill of 1832, which was passed after the opposition of the peers had been overcome by the threat of numerous creations. This act completely remodeled Parliament. In England 143 votes were taken from boroughs and redistributed among the counties and large towns. The county franchise was given to freeholders or copyholders to the value of £10 a year, to leaseholders for twenty years whose annual rent was £50, and to tenants at will who paid £50 a year. The borough franchise was given to all holders of houses to the annual value of £10. For Scotland the number of members was increased from 45 to 53, of whom 30 were to sit for the counties and 23 for the cities and boroughs. The county franchise was given to all holders of property to the annual value of £10, while the borough franchise was made the same as that of England. For Ireland the number of members was raised from 100 to 105. Both the borough franchise and the county franchise were given as in England, except that the occupation franchise in the counties was limited to holders of land to the value of £20 per annum. This provision was designed to prevent the control of the priests, who were much feared after the Catholic Emancipation Act of 1829. With the Reform Bill the parties took new names, the Tories being succeeded by the Conservatives, the Whigs by the Liberals. Since then Parliament has undergone little change in its essential features, though several reform acts have been passed. In 1867 household suffrage was established in boroughs, with a lodger franchise at a value of £10; in the counties existing qualifications were reduced by one-half and an occupation franchise at £12 was created. There was also a slight redistribution of seats. In 1872 voting by secret ballot was established. In 1884 there was a thorough redistribution of seats, with an attempt to make equal electoral districts, and an assimilation of the county and borough franchises. In 1885 the franchise was again somewhat extended so that at present there is nearly universal suffrage in Great Britain and Ireland. Meanwhile the House of Commons has become by far the most important branch of the Government. It rules the country absolutely and is quickly responsive to popular demands. The following table illustrates the composition of the House of Commons in 1903:

	Counties	Boroughs	Universities	Total members
England	234	226	5	465
Wales	19	11	0	30
Scotland	39	31	2	72
Ireland	85	16	2	103
	377	284	9	670

Details concerning the existing system of parliamentary government will be found in the section *Government* under GREAT BRITAIN, but something remains to be said of certain customs of Parliament. The Houses of Parliament or New Palace of Westminster, in which Parliament sits, were opened in 1852, though the assembly has had its abode on that site for six centuries. The former building was destroyed by fire in 1834. The Commons' Chamber is in the north side of the building, the Lords' in the south. About them are the retiring rooms of their respective members, and the residences and bureaus of their officials, aside from a great number of other apartments. Unless sooner dissolved, a Parliament lasts for seven years. It meets about the middle of January or early in February, and when it has completed its work it is prorogued, though either House may adjourn for a short time on its own initiative. Business is now rarely completed before August or September. A new Parliament is opened with imposing ceremonies, the hour fixed being usually two o'clock. In the morning the vaults are searched for possible bombs and the like, in memory of the plot of Guy Fawkes (q.v.). By one o'clock every seat in the House of Commons is occupied, since there are many more members than seats. The members of the Government party occupy the benches—there are no desks—to the right of the Speaker; the members of the Opposition those to the left. A member secures a seat by placing upon it his hat, or since 1895 a card marked with his name. The House is opened by the clerk, who is chair-

man till the Speaker is elected. The first incident of the session is the summoning of the Commons to the Peers' Chamber by the Black Rod, the messenger of the Upper House, to hear the royal message. When the King does not open Parliament in person, this is read by the Lord Chancellor. Before the actual reading of the King's speech, the Commons return to their own chamber to elect a Speaker. The Speaker is not a party leader, as in the United States, but is supposed to be strictly impartial, and is usually reëlected regardless of the party in power. He receives an annual salary of £5000, and has some perquisites, such as an official residence. He ranks as first commoner, and when he retires he is usually rewarded with a peerage and a yearly pension of £4000. The chairman of the House of Lords is the Lord Chancellor, whose official seat is the celebrated Woolsack. He is ordinarily a member of the Cabinet. Most of the measures introduced into Parliament are Government bills, and a vote is taken by the members passing out of different doors into the lobby and being counted in the process. Each party has designated members, known as 'whips,' who gather the party forces for important divisions in the House of Commons.

Besides the general histories, which will be found in the bibliography under GREAT BRITAIN, consult: Gneist, *The English Parliament in Its Transformations of a Thousand Years*, Eng. trans. (4th ed., London, 1895); Smith, *History of the English Parliament* (ib., 1892); Skottowe, *A Short History of Parliament* (ib., 1886); Dickinson, *The Development of Parliament During the Nineteenth Century* (ib., 1895). For the many interesting customs of Parliament and its method of work, consult MacDonagh, *The Book of Parliament* (ib., 1897).

PARLIAMENT, HOUSES OF, or NEW PALACE OF WESTMINSTER. The seat of the British legislature, a great mass of buildings on the Thames in London, built at a cost of $15,000,000 after plans by Sir Charles Barry on the site of the previous building, which was destroyed by fire in 1834. The edifice covers an area of eight acres, and contains 1100 apartments, 100 staircases, and 11 courts. The exterior, in rich late-Gothic style, is made impressive by three massive towers: Victoria Tower, 340 feet high; Middle Tower, 300 feet high; and Saint Stephen's or the Clock Tower, 318 feet high. The latter contains a clock with dials 23 feet in diameter, and a great bell, 'Big Ben,' weighing 13 tons. The interior is fitted up with much magnificence. In it are the sumptuous House of Peers and the simpler House of Commons, an octagonal central hall, Saint Stephen's Hall on the site of Saint Stephen's Chapel, the former meeting place of the Commons, the residence of the Speaker and other officials, the libraries, committee rooms, and lobbies connected with the two Houses, and offices. With the edifice is connected Westminster Hall (q.v.). An unsuccessful attempt to destroy the palace by explosions of dynamite was made in 1885. For illustration, see Plate accompanying the article LONDON.

PARLIAMENTARY LAW. The body of rules and precedents regulating the procedure of deliberative assemblies. Certain rules of parliamentary procedure have always been found necessary for the accomplishment of the purposes for which deliberative assemblies are called. Experience has shown that restrictions must be placed on individual members in the general interest of the whole body; that mere customary rules are insufficient, and hence regular parliamentary codes must be prepared for the government of deliberative assemblies. In the United States this has become almost a distinct branch of the law, and its mastery is highly essential to the success of the legislator. The necessary officers of a deliberative assembly are a chairman, usually called Speaker, president, or moderator, and a secretary or clerk. It is the duty of the presiding officer to call the meeting to order; to state clearly all questions brought before the assembly; to put motions properly made and in their proper order; to preserve order and enforce the rules of procedure; and decide questions of order subject to the right of appeal to the whole assembly. These are his primary duties, but he may in addition participate in debate as any other member, and vote in case of a tie. It is the duty of the secretary to keep a record of the proceedings of the meeting, including a correct statement of every motion made and the manner in which it was disposed of; the names of members of all committees appointed; a true copy of every resolution passed with the affirmative and negative votes cast thereon, etc.

Business is or should be brought before an assembly by motion of a member or in the form of a resolution which is presented by a member who at once moves its adoption. If it is a mass meeting called for a particular purpose, a motion is made for the appointment of a chairman, who, upon taking the chair, asks for a statement of the purpose for which the meeting is called. A proposition which is presented to an assembly is usually called a *motion* if it relates to a matter of secondary importance; and a *resolution*, if of greater importance. The difference is of no practical consequence, however, since a resolution may be offered as a motion and a motion may be presented in the form of a resolution. The member upon whose motion the subject under discussion was brought before the assembly, or upon whose report the conclusion of a committee is presented, is entitled to be recognized as having the floor, although another member may have already risen and addressed the chair. No member who has once had the floor is again entitled to it while the same question is before the assembly so long as any member who has not spoken claims the privilege of the floor. From the decision of the chairman as to the claim of two members for the floor an appeal may be taken, or, in first instance, the chairman may refer the question directly to the assembly for decision. It is the custom, except in the United States Congress, to require important motions to be seconded as a means of assurance that the measure has the support of more than one member. The motion is often seconded as a matter of courtesy, though the person seconding it may not favor it. After the motion has been made and seconded, the chairman clearly states it to the assembly and then recognizes the author of the motion, who is entitled to the floor if he wishes to claim it, or else the first member who rises and addresses the chair. The question is now before the assembly and cannot be withdrawn or modified by the mover, if any member objects, except by obtaining leave from the assembly or

by moving an amendment. Before the chair has put the question, however, the mover may withdraw it without the consent of the assembly.

The question on the adoption of a motion or resolution is usually known as the main question, and during the consideration of it the introduction of any other question is not permissible, but it is allowable to make subsidiary motions that may aid in disposing of the main question, or such as arise incidentally in the course of the consideration of the main question, or such as relate to the rules of procedure, the privileges of members, or the termination of the meeting. Among the subsidiary motions for disposing of the main question, all of which must be decided before the main question can be acted upon, are: First in precedence, the motion to lay on the table. The purpose of this motion is to postpone further consideration of the question until some future time, when it may again be taken up, which would not be allowable had the question been disposed of by a motion to postpone either definitely or indefinitely. This is a common method of suppressing a question, and is successful whenever a majority cannot be found to take it from the table during the session. A motion to lay on the table is not open to debate, cannot be amended, nor can another subsidiary motion be applied to it. The effect of the motion is usually to place on the table everything pertaining to the subject; thus, if an amendment be ordered to lie on the table the subject which it is proposed to amend is also laid on the table. A second means of disposing of the main question by means of a subsidiary motion is the demand for the previous question. This takes precedence of every debatable question, but is itself open to neither debate nor amendment. It applies to questions of privilege as well as to any other debatable question. Its effect is to stop immediately all debate and bring the assembly to a vote on the question pending. When a demand is made for the previous question and seconded, the presiding officer immediately puts the question, "Shall the main question now be put?" If the question is lost, the discussion continues as if the motion had not been made. The previous question requires a two-thirds vote for its adoption, may be demanded on a pending amendment, and if carried, debate on the amendment only is closed, the main question being still open to debate and amendment. It may also be used on an amendment to an amendment. (See PREVIOUS QUESTION.) A third method of disposing of the main question is by means of the motion to postpone to a certain day. Debate on this motion is limited, and must not go into the merits of the subject matter any further than may be necessary to enable the assembly to judge of the propriety of the postponement. The effect of this motion is to postpone further consideration of the subject until a certain time, during which period it cannot be taken up except by a two-thirds vote. When that time arrives the question is entitled to be taken up in preference to everything except privileged questions. In the fourth place, the main question may be disposed of by a motion to commit or recommit. The purpose of this motion is to refer the subject to a committee. If different committees are proposed, they should be voted on in the following order: (1) Committee of the whole; (2) a standing committee; (3) a special committee. The committee, if a select one, may be appointed by the Chair or nominated by a member or members and elected by the assembly. The motion to commit is debatable, and the merits of the question may be gone into. In the next place, the main question may be disposed of by a motion to amend, which may take either of the following forms: (1) to *'add'* or *'insert'* certain words or sentences; (2) to *'strike out'*; (3) to *'strike out certain words and insert others'*; (4) to *'substitute'*; and (5) to *'divide the question.'* A paragraph once inserted cannot be struck out or amended except by adding to it. Similarly, words inserted cannot be struck out except by a motion to strike out the paragraph or a portion thereof. Certain motions are never open to amendment; among these are the motions to adjourn, to lay on the table, to postpone indefinitely, to reconsider, an amendment of an amendment, a demand for the previous question, for the orders of the day, and all incidental questions. An amendment may itself be amended, but not so as to alter its form. While an amendment is pending it is not in order to make another motion to amend until the first amendment is disposed of. Lastly, the main question may be disposed of by a motion to postpone indefinitely. This motion opens to debate the whole question which it is proposed to amend, but, as already observed, it cannot itself be amended. Its effect is to withdraw the question from the further consideration of the assembly for the remainder of the session. The previous question applies to this motion without affecting the main question.

What are called incidental questions are those which often arise in the course of the consideration of the main question, and consequently take precedence of the questions out of which they arise. Such questions are unamendable, and, with a single exception, are undebatable. The incidental questions are those of appeal, objection to the consideration of a question, the reading of papers, leave to withdraw a motion, and suspension of the rules. The appeal arises out of objection raised to a decision of the chair on a question of order. The decision of the presiding officer is made without debate, and if a member objects to the result of the decision, he may say "I appeal from the decision of the Chair." If the appeal is seconded, the chairman puts the question as follows: "Shall the decision of the Chair stand as the judgment of the assembly?" If there is a tie vote the decision of the Chair is sustained. The appeal is the only incidental question which is open to debate, and there are a few cases when it cannot be debated. When debatable, no member is allowed to speak more than once. If the presiding officer neglects to enforce the rules of procedure, any member may call his attention to the breach of order by rising and saying, "Mr. Chairman, I rise to a point of order," whereupon the chairman will request the member to state his objection, which he does, and then resumes his seat. If the chairman decides that the point of order is not well taken, and no appeal is made against the decision, the first member is permitted to resume his speech. If the decision sustains the point of order, and objection is made, he cannot continue without a vote of the assembly. It is in order for any member to object to the consideration of the main question before debate has begun on it. The objection does not require a second, and may

be made while another member has the floor. It cannot be debated, amended, or have any other subsidiary motion applied to it. Whenever objection is raised to the consideration of a motion the chairman states the question, "Shall the question be considered?" Unless an affirmative vote of a two-thirds majority is secured, further consideration for the remainder of the session is ended, otherwise the discussion continues as though objection had never been raised. The purpose of this motion is not to cut off debate, but to avoid the discussion of any question which may seem irrelevant or inexpedient. Any member has the right to ask for the reading of papers for the information of the assembly, but if an objection is raised, the decision is rendered by the Chair subject to appeal to the assembly. It is in order for the mover of a question which is before the assembly to withdraw it or substitute another in its place, if no one objects. If objection is made, it is necessary to obtain leave to withdraw or substitute, which may be done by motion. Such a motion is neither debatable nor amendable. A motion to suspend the rules is one of the important incidental motions. Like the others of its kind, it cannot be debated or amended. It cannot be renewed at the same meeting for the same purpose, nor is it allowable except for a definite purpose, and then only by a two-thirds vote.

Another class of motions are those which are commonly known as privileged questions. They take precedence of all other questions, and are not open to debate except when they relate to the rights of the assembly or of its members. Privileged questions include motions to fix a time for adjournment, to adjourn, motions relative to rights and privileges of the assembly or of its members, and the call for the orders of the day. The motion to fix a day for adjournment takes precedence of all other privileged motions, and is in order even after the assembly has voted to adjourn, provided the chairman has not announced the result of the vote. Next in precedence is the motion to adjourn. This motion is neither debatable, amendable, nor open to reconsideration after a vote has been taken. If the adjournment does not close the session, all unfinished business has precedence over new business at the next meeting, and is treated as if there had been no adjournment. If the adjournment closes the session, and the next session is that of a new assembly, an end is put to all business unfinished at the close of the session, and it can be brought before the assembly only by being reintroduced. Questions of privilege are decided by the presiding officer, subject to the right of any two members to appeal from the decision. The assignment of one or more subjects to a particular day constitutes the orders of the day, and they are not open to consideration before that time except by a two-thirds vote. The orders of the day are classified as special and general, the former always taking precedence of the latter. A special order involves suspension of all rules that interfere with its consideration at the time specified, and it therefore requires a two-thirds vote to make any question a special order. The effect of an affirmative vote is to withdraw the question then under consideration as though an adjournment had happened. It is in order at any time, even though the floor is already occupied, to move a reconsideration of a previous vote on any measure, unless another question is before the assembly at the time. Unless the vote is by ballot, the motion to reconsider must be made by a member of the prevailing side, and only on the day the vote was taken which it is proposed to consider. No question can be twice reconsidered, and a motion to reconsider cannot be amended, although it is debatable, nor even debated if upon up for discussion the question subject to be reconsidered. If the motion to reconsider is carried, the original question is in the condition it was in before the last vote was taken, and must be disposed of as if it had not been voted on. No one can debate the question reconsidered who had previously exhausted his right of debate on the question, although it is allowable to discuss it while the motion to reconsider is before the assembly.

The preliminary work of deliberative bodies is usually prepared by means of committees. These may be standing committees appointed for a definite time, select committees appointed for a special purpose, and committees of the whole consisting of the entire assembly. The first person named on a committee is usually the chairman, whose duty it is to call the committee together. A committee may facilitate its labors by the appointment of a subcommittee of its own membership. A committee report is usually made by the chairman, is signed by the members and delivered to the clerk. In case of disagreement among the members, there may be a majority and a minority report. The report of the majority is the report of the committee, and it may be adopted by the assembly, rejected, or recommitted. After the report has been adopted, the question is open to amendment as if there had been no committee report. An assembly may go into "committee of the whole" for the consideration of a subject which it does not wish to refer to a committee, but which it is desired to consider with the freedom and informality which characterizes the procedure of committees. When this is done, the presiding officer calls another member to the chair and takes his place as a member of the committee. During the consideration by committee of the whole no motions are in order except to amend and adopt, or that the committee 'rise and report.' Debate may be without limit unless the assembly votes that debate in committee shall cease at a certain time, and until then any member may speak as often as he can get the floor if no one else who has not had an opportunity to speak on the question claims it. When the debate is concluded, a motion is made that 'the committee rise and report.' This motion is always in order and is undebatable. When it is adopted, the presiding officer of the assembly resumes the chair, while the chairman of the committee, having resumed his place in the assembly, reports to the Chair the decision of the committee. Like other committees, the committee of the whole has no power to alter the text of any resolution referred to it. It is the practice of many deliberative assemblies to consider certain questions 'informally' without going into committee of the whole, a procedure which is not very different from that of committee of the whole. This is the practice of the United States Senate in the consideration of measures on their second reading.

Debate upon a motion begins after it has been

stated by the chairman and is closed by the chairman rising to put the question. If the presiding officer thinks the debate has ended, he inquires if the assembly is ready for the question, and if no one claims the floor, he puts the question to a vote. The rule of the United States House of Representatives requires that those favoring the motion shall indicate their preference by saying *Aye*, and those opposing it say *No*. If when the presiding officer announces the result any member rises and expresses doubt as to the correctness of the result, or calls for a division, the presiding officer requests those who favor the motion to rise. After counting these and announcing the result, those opposed are requested to rise. These are counted and the final result is then declared. Or he may appoint tellers to make the count and report to him. Whenever there is a tie vote, the motion is lost unless the presiding officer gives his vote for the affirmative. If his vote will cause a tie, he may cast it and thus defeat the measure. Still another form of ascertaining the wish of members is the ballot. The following motions require a two-thirds vote for their adoption: Amendment or suspension of the rules, making of special orders, objections to the consideration of a question, the demand for the previous question, and the closing or limiting of debate.

The most convenient and in some respects the most authoritative manual of parliamentary law is Robert, *Rules of Order* (Chicago, 1883 and 1901). Consult, also, Stevens, *Law of Assemblies* (Minneapolis, 1901); Hackett, *The Gavel and the Mace* (New York, 1900); Thomas Brackett Reed, *Rules of Order;* Cushing, *Manual of Parliamentary Practice* (Boston); *Rules and Practices of the Senate and House of Representatives of the United States* (Washington).

PARLIAMENT OF DUNCES, The. The Parliament of 1404, under Henry IV., to which, because no lawyers were admitted, the name *Unlearned* or *Lawless* (Parliamentum Indoctum) was given by Sir Edward Coke.

PARLIAMENT OF FOWLS, The, or The Assembly of Fowls. One of Chaucer's minor poems, written in his favorite form of a vision. A student reading the "Dream of Scipio" in Cicero's *Republic* falls asleep, and is led by Scipio into a garden where nature assembles the birds on Saint Valentine's Day, and holds a court of love. The poem is taken partly from Boccaccio's *Teseide* and alludes to other Italian sources, but is based mainly on Macrobius's *Commentary on Scipio's Dream*, a favorite book in the Middle Ages.

PARLOA, pär'lō-ä', Maria (1843—). An American domestic economist, born in Massachusetts. She appeared in Boston as a lecturer on cooking in 1877, was special instructor, or lecturer, at various seminaries in Massachusetts and New Hampshire, and gave courses of lessons in sick-room cookery to Harvard medical students. In 1878 she visited Paris for study; in 1881 lectured in Western cities, and in 1882 opened a cooking-school in New York City. Her publications include: *Miss Parloa's New Cook Book and Marketing Guide* (1882); *The Young Housekeeper; Home Economics;* and other books of a similar nature.

PARMA, pär'mä. Before 1860 a duchy in Northern Italy, lying between Sardinia, Lombardy, Modena, and Tuscany. The city of Parma was one of the colonies established along the Æmilian Road by the Romans after the conquest of Cisalpine Gaul in B.C. 222. It was included in the Ostrogothic, Lombard, and Frankish kingdoms, and ultimately in the new German Roman Empire. In the eleventh century it was an appanage of Tuscany, and as such passed to the Countess Matilda, and may have been included in her donation to the Papacy (1102). Lucchino Visconti, ruler of Milan, bought it from Obizzo d'Este about 1346. It passed, together with Milan, to the Sforza, and in 1499 was included in the conquests of Louis XII. of France. In 1511 Pope Julius II. retook it from the French. In 1515, when Francis I. reconquered the Milanese, he reannexed to it Parma and Piacenza, with the Papal consent; but in 1521 it was retaken by the Papal and Imperial troops. In 1545 Pope Paul III., one of the Roman House of Farnese, separated Parma and Piacenza from the Papal domains and erected them into duchies for his natural son, Pietro Luigi Farnese, whose son, Ottavio, married Margaret, natural daughter of the Emperor Charles V. Pietro Luigi, after two years of tyranny, was assassinated by his exasperated subjects, and Parma and Piacenza were seized for the Emperor. Thereupon Paul III. retracted his grant and resumed the Papal claim. His successor, Julius III., who owed his election to the Farnese support, restored Parma to Ottavio Farnese. The Emperor retained Piacenza, and in 1551 sought to take Parma, whereupon Ottavio sought the protection of France. Philip II., to secure his alliance against France in 1556, when Italy was menaced by a new French invasion, restored to him Piacenza, though a Spanish garrison remained there. Alessandro Farnese, son of Ottavio, entered the Spanish service and rose high in Philip's favor, and in 1585 the Spanish troops were withdrawn. Duke Ottavio was succeeded in 1586 by Alessandro, who died in the Netherlands in 1592. The latter's son, Ranuccio, succeeded to the duchies under the guaranty of Spain and the Pope. Elizabeth Farnese, Queen of Philip V. of Spain, in 1725 secured the reversion of Parma and Piacenza to her son, Don Carlos, who received them upon the death of the reigning Duke, Antonio, without issue, in 1731. Carlos exchanged them in 1735 with Austria for the Two Sicilies. In 1748 Parma and Piacenza, together with Guastalla, were handed over by Austria to the Spanish Bourbons in the persons of the Infante Don Philip, with a reversion to Austria in case of failure to him of male descendants, or in case any of his descendants should ascend the Spanish or Neapolitan throne. In 1765 Philip was succeeded by his son, Ferdinand, who expelled the Jesuits in 1768. In 1801 Bonaparte concluded the Treaty of Madrid with Spain, by the terms of which Parma, Piacenza, and Guastalla were to be given to France on the death of Ferdinand, in exchange for which Don Luis, the son of Ferdinand, was made King of Etruria. France came into possession by the death of Ferdinand in the following year. The Treaty of Paris (1814) gave Parma, Piacenza, and Guastalla as a duchy to Maria Louisa, Napoleon's wife, and this was carried out, notwithstanding the protest of the King of Spain in behalf of the widow of the

King of Etruria. On the death of Maria Louisa in 1847 the duchy reverted to Charles, Duke of Lucca, son of the King of Etruria, who succeeded as Charles II. Guastalla was given to Modena, and some small districts were added to Parma. The rule of Charles was tyrannical and illiberal. On the outbreak of the Revolution in 1848 he was forced to grant the popular demands, but he soon afterwards left the country. Parma joined Sardinia against Austria, and was involved in the defeat of its ally. In March, 1849, Austria imposed upon Parma the rule of Charles III., son of Charles II., who had abdicated. The arbitrary rule of Charles III. was closed by his assassination in 1854, when his widow, Louise Marie Thérèse de Bourbon, assumed the government in behalf of her son, Robert I. She made some attempt at reform, but left the country with her son on the outbreak of the war of 1859. On March 18, 1860, Parma was annexed to Sardinia and became a part of the new Kingdom of Italy by the will of its people. It now forms the two provinces of Parma and Piacenza.

PARMA. The capital of the Province of Parma, Italy, situated on both sides of the river Parma, 12 miles south of the Po and 75 miles southeast of Milan (Map: Italy, E 3). The town is circular in form, and is surrounded by walls and ditches flanked by bastions. The site of the former fortifications is now nearly a complete circle of promenades. The streets are straight and wide, and meet at right angles. The Roman Via Emilia, here called the Corso Vittorio Emanuele, crosses the city from east to west, dividing it into two nearly equal parts. It traverses the Piazza Grande, where the official palaces and the statues of Correggio and Garibaldi stand. The northwest corner of the town is laid out in a fine public park. Here is situated the Del Giardino Palace, now a military school, constructed by the Farnese, and containing frescoes by Carracci. Along the opposite side of the city extends the Stradone promenade.

Parma has notable churches. The cruciform cathedral (consecrated 1106 A.D.) is built in the Lombard-Romanesque style. In the octagonal dome is Correggio's "Assumption." The Baptistery is a splendid edifice of Veronese marble, completed in 1270. It is surmounted by several turrets, and the exterior is richly ornamented with tablets representing symbolic scenes. In the interior is a series of good reliefs. The Madonna della Steccata, a Renaissance church in the form of a Greek cross, contains mural paintings by Parmigiano. The San Giovanni Evangelista is a fine Renaissance creation of eminent architects. It dates from 1510. The dome has noteworthy frescoes by Correggio, who has also here a valued "Saint John the Evangelist."

The large but incomplete Palazzo della Pilotta owes its origin to the Farnese. In it are Parma's valuable art collections. In the museum of antiquities here are meritorious bronze statuettes. Its picture gallery contains good paintings by Giulio Romano, Canova's statue of Marie Louise, Holbein the Younger's "Erasmus," paintings and drawings by Parmigiano, and also famous examples of Correggio. Of these last the "Madonna della Scodella" is the most prominent. Other excellent works by Correggio are a "Descent from the Cross," a "Martyrdom of Saints Placidus and Flavia," and two Madonnas. The public library (Palatina) in the same edifice contains over 300,000 volumes and about 5000 manuscripts, some of the latter of great interest and value. The Teatro Farnese is also here, dating from 1618, and latterly restored. In the Convent of San Paolo, now used for a school, are found masterful frescoes by Correggio. The university was founded in 1542. There are faculties of jurisprudence, mathematics and science, and medicine and surgery. In 1902 it had 42 instructors and 621 auditors. Its paleontological collection and its African fauna from the Italian colonies are noteworthy. Connected with the university are a botanic garden, an observatory, and a pharmaceutical school. Among the other educational institutions of Parma are an Episcopal seminary, a lyceum, an agricultural institute, an academy of fine arts, and a school of music. The city is notable in art history as the place of residence of Correggio and the birthplace of Parmigiano.

Parma has manufactures of musical instruments, silks, woolens, linens, felt hats, leather, glass, and ironware. There is also a royal tobacco factory. The printing establishment, founded by Bodoni in 1766 is famous in Italy. The trade is chiefly in wine, grain, cattle, and cheese. In June is held a silk fair. Population (commune), in 1881, 45,217; in 1901, 49,340.

PARMA, Alessandro Farnese, Duke of, Spanish governor of the Netherlands. See Farnese.

PARMA, Jean Jacques Régis Cambacérès, Duke of. See Cambacérès.

PARMEN'IDES (Lat., from Gk. Παρμενίδης). A Greek philosopher of the fifth century B.C., and the most famous member of the Eleatic School (q.v.). Little is known of his life, but he was greatly revered in antiquity for his intellectual powers and noble character. He is said, when sixty-five years old, to have visited Athens, where Socrates, then a young man, heard him. Like his master Xenophanes, Parmenides set forth his philosophical doctrine in verse—his work being entitled *On Nature* (Περὶ Φύσεως). Considerable fragments of it are still extant. The leading design of this poem is to demonstrate the reality of actual being, the non-existence of which Parmenides declares to be inconceivable, but the nature of which, on the other hand, he admits to be equally inconceivable, inasmuch as it is dissociated from every limitation under which man thinks. As for the phenomena of nature, they are only apparent and due to man's error; they only seem to exist, but have no real existence. Apparently Parmenides made no attempt to grapple with the inevitable contradiction between the doctrine of being and that of seeming. The fragments are published by Karsten, *Philosophorum Graecorum Veterum Reliquiae*, vol. i. (Amsterdam, 1835); Stein, in *Scholia Philologorum Bonnensium* (Bonn, 1867); Ritter and Preller, *Historia Philosophiae Graecae* (7th ed., Gotha, 1888); Diels, *Parmenides' Lehrgedicht, griechisch und deutsch* (Berlin, 1897). Consult Zeller, *Philosophie der Griechen*, vol. i. (5th ed., Leipzig, 1892).

PARME'NION (Lat., from Gk. Παρμενίων) (c.399–329 B.C.). A Macedonian general, who served under Philip and Alexander the Great. In 356 he defeated the Illyrians; in 342 carried

out a successful campaign in Eubœa; and in 337 was sent into Asia Minor to pave the way for the conquest of Persia. While he was there Philip was assassinated. Parmenion, his most trusted servant, remained faithful to Alexander and acted as his military adviser and as commander of the infantry. In 330, when Parmenion was in Media guarding the booty, his son, Philotas, was accused of treason against Alexander and was executed, after having implicated his father. Alexander may have believed the charge or feared vengeance from Parmenion; at any rate he had him put to death.

PARMIGIANO, pär'mē-jä'nō, or **PARMEGIANINO** (1503-40). An Italian painter, whose real name was Mazzuoli, or Mazzola, and who was called Parmigiano from his birth-place, Parma. He was the most talented of a group of mannerists, who attempted to amalgamate the schools of Rome and Parma. He early came under the influence of Correggio and became a successful imitator of his style. In 1523 he went to Rome, where his first manner underwent great modification, due to his study of the masterpieces of Michelangelo and Raphael. His Roman career was interrupted by the sack of the city in 1527 by the soldiers of Charles V. The picture of Saint Jerome, National Gallery, London, was painted at this time. Taking refuge in Bologna, after a residence there of three years, he returned to Parma in 1531. During this year he contracted to execute a series of frescoes in the Church of Madonna della Steccata. Receiving half payment in advance and failing to fulfill the terms of the agreement, he was imprisoned by the church authorities in 1537. Upon promising to complete the work, he was released from prison, but fled to Casalmaggiore, where he died August 24, 1540. Parmigiano's principal altar-piece is "Santa Margherita" in the Academy at Bologna. Probably the most popular production of the artist is "Cupid Making a Bow" (1536, Vienna), frequently attributed to Correggio. Consult Affò, *Vita del Mazzola* (Parma, 1784).

PARNAHYBA, pär'nä-ē'bà. The name of two rivers and of a town in Brazil. See PARANAHYBA.

PARNASSIENS, Les, lā pär'nä'syăN'. A school of French poets, so named because they contributed to a lyric anthology known as *Le Parnasse Contemporain*. One of the first Parnassiens to come forward was Théodore de Banville (1823-91); but the real founder of the school was Théophile Gautier (1811-72), who formulated the doctrine of art for art's sake. Gautier's unhappy friend Baudelaire (1821-67) upheld this poetic dogma, but he died rather too early to belong to the Parnassian school, save by his tendencies. Under the leadership of Leconte de Lisle (q.v.), in whose house they gathered on Saturdays as early as 1856, a score of writers composed poems wherein they endeavored to suppress personal feeling, to avoid preaching, and to cultivate art for art's sake. Leconte de Lisle himself was called the impassive, but in him, as in others, one often feels an emotional lyric undertone, and this bursts forth in a truly lyric cry in *Les Montreurs*, a poem in which Leconte de Lisle utters his beliefs with a great lack of his habitual Olympic impassivity. The Parnassiens aimed at great finish in thought and form, and many of them achieved their aim. Xavier de Ricard, Anatole France, Catulle Mendès, Armand Silvestre, François Coppée, Sully Prudhomme, Léon Dierx, and José Maria de Hérédia, to name the most distinguished Parnassiens, undertook also to rid French poetry of a false sentimentality, borrowed, they thought, from the Lake School (q.v.), and to combat the imitation of Lamartine.

PARNAS'SUS (Lat., from Gk. Παρνασσός). A mountain in Phocis, Greece. It has twin peaks, now called Gerantorachos and Lykeri (8070 feet), which rise from a rough plateau and form a conspicuous landmark in Eastern Greece. During all but the summer months the summits are covered with snow. From the plateau rise other lesser peaks, and on the side of a hill at the south above Delphi is the Corycian Cave, dedicated to Pan and the Muses. On the slope of Parnassus was the fountain Castalia (q.v.), whose waters were supposed to fill the minds of those who drank of them with poetic inspiration. The Thyiades are said by Pausanias to have celebrated the orgies of Dionysus on the highest summits. On the southern slope lay Delphi (q.v.), the seat of the famous oracle.

PAR'NELL, CHARLES STEWART (1846-91). An Irish statesman and Parliamentary leader. He was born at Avondale, in the County of Wicklow, Ireland, June 28, 1846, of an old Protestant family. He was the son of John Henry Parnell and Delia Tudor Stewart, daughter of Rear-Admiral Charles Stewart of the United States Navy. Parnell was educated in the University of Cambridge, but returned to Avondale without a degree. After traveling in the United States (1872-73) he became high sheriff of his county, and in 1875 he entered Parliament for Meath County. From the outset he displayed remarkable ability for leadership in politics and for parliamentary warfare. Reserved and dignified, with few of the ordinary graces of an orator, Parnell contrasted strikingly with the enthusiastic impulsive Irish debater of the type of O'Connell. But the very absence of these Irish qualities impressed upon the English the fact that now for the first time they had to reckon with a strong, well-directed Irish opposition.

In 1877, in conjunction with Biggar, Parnell brought together the hitherto disunited forces of opposition in a compact party of Nationalists, whose object was Home Rule for Ireland in all local affairs, including necessarily the restoration of the Irish Parliament. (See HOME RULE.) The method of political warfare followed by Parnell was bold and effective. He adopted extreme tactics of obstruction: to delay all public business as far as possible; to make combinations with any party that might be in opposition in order to embarrass the Government; to use the balance of power in such a way as to secure concessions as the price of votes; and, in a word, to make all legislation extremely difficult until the demands of Ireland should be considered and accepted. For the support of this policy Parnell looked to the Fenians of Ireland and of America, and to the Land League, which he helped organize in 1879, and of which he was the first president. The object of the League was not only to secure fair rents and

to transfer the ownership of the soil to the tenants, but also to bring about Home Rule. (See LAND LEAGUE.) Meantime Parnell carried out his Parliamentary warfare with singular tenacity and persistence, against the bitter opposition of both of the great English parties. The conservative traditions of the House of Commons were speedily set at naught; its rules were ingeniously perverted to defeat their own objects; every important piece of legislation was attacked, delayed, and in some cases defeated by the able combinations of the Irish party under its great leader, with some of the other elements of opposition. In 1877 and 1878 the Parnellites, as they began to be called, persistently opposed the bill for the annexation of the Transvaal, the flogging clauses of the Mutiny Act, and the Prisons Bill; and, joined by Joseph Chamberlain and leading Radicals, they carried the bill abolishing flogging in the army. Side by side with the development of this new policy the land agitation in Ireland grew and became a source of widespread public interest. To aid the movement, and to relieve those tenants who suffered by eviction, Parnell in the winter of 1879-80 made a visit to America, where he raised large sums by popular subscription. On his return he was simultaneously elected to Parliament from Meath, Mayo, and the city of Cork, the last of which he chose to represent. His claim to lead his party was formally ratified when in May, 1880, the Irish members of Parliament chose him leader by a vote of twenty-three to eighteen. Supported by powerful social and political organizations, and at last by the Catholic Church, and controlling the words as well as the votes of his followers with a strong will and an iron hand, Parnell was now a formidable power in English politics. Continuing the land agitation, he was arrested and imprisoned in October, 1881, on the charge of intimidation, and of obstructing the operation of the new Land Act. (See IRISH LAND LAWS.) He remained in Kilmainham jail until April, 1882, when he was released on parole.

At the general election of 1885 he was reëlected from Cork, and by a political bargain with the Conservative Party secured the election of a number of Conservative candidates, though soon afterwards he repudiated the agreement and threw his votes on the Liberal side (January, 1886), thus defeating the Conservative Administration of Lord Salisbury. Gladstone, who by this change succeeded to office, was now definitely committed to the adoption of a measure of Home Rule for Ireland, and henceforth the Irish supported the Liberal Party. On April 8, 1886, Gladstone had a bill introduced to give Home Rule, which ruptured the Liberal Party and led to the formation of the new Liberal Unionist Party (q.v.), and Gladstone's Administration was thereupon defeated and resigned in July, 1886. Nevertheless, Parnell introduced a bill for the relief of tenants, which, as a whole, the Salisbury Government refused to accept, though many of its important provisions were subsequently incorporated into the Government's own measure. Toward the close of the session of 1887 a sensation was caused by the publication in the *London Times* of the fac-simile of a letter purporting to have been written by Parnell to a friend, palliating the murder of the permanent Under-Secretary for Ireland, Thomas Henry Burke, in Phœnix Park, Dublin, in 1882. On the night of the publication of this document Parnell returned to the House of Commons, from which he had been absent, and denounced the letter as a base and infamous forgery. But when Sir Charles Lewis, a Conservative, moved that the publisher of the *Times* should be prosecuted for libel at the expense of the Government, the Irish members declined on the ground that they had no confidence either in the Government or in English juries. Some time afterwards this letter and others of a similar nature were found on investigation by a judicial commission to be the forgeries of a man named Pigott, who after the exposure fled from the country and died at Madrid by his own hand. Parnell brought suit for libel against the *Times*, and recovered £5000 damages. He was now at the very height of his prestige, but his downfall was near at hand.

For a long time rumors had been current in political circles connecting the name of Parnell with that of the wife of Capt. W. H. O'Shea, formerly member of Parliament for Galway, and long an enthusiastic follower of Parnell. These rumors were confirmed when in 1889 Captain O'Shea applied for a divorce from his wife on the ground of adultery with Parnell. The case was tried in November, 1890, and, as no defense was made, the divorce was granted, and Parnell was condemned in costs. This decision proved fatal to his reputation and political power. His offer to resign the leadership of the Irish party was at first declined, but soon it became known that Gladstone had written to John Morley that the continuance of Parnell's leadership would be disastrous in the highest degree to the cause of Ireland, implying that Parnell could no longer have the support and coöperation of the English Liberals. After this letter had been made public it was supposed that Parnell would renew his offer to resign. As he resolutely refused to give up the leadership, he was deposed by a vote of his Parliamentary colleagues. The result was a division of the Irish party into Parnellites and Anti-Parnellites. The fallen leader now bitterly denounced both Gladstone and his own late colleagues who had turned against him. His appeal to the people, however, was answered by the defeat of three Parliamentary candidates whom he had nominated. Nevertheless, he struggled with desperate energy to recover his leadership till his health broke down completely, in September, 1891. In July of that year he had married Mrs. O'Shea, and on the 6th of October following he died.

Consult: Hansard, *Reports*, 1875-91, for his Parliamentary speeches; Lucy, *Diary of Two Parliaments, 1874-85* (London, 1885-86); *Diary of the Salisbury Parliament, 1886-92* (ib., 1892); *Annual Register*, 1875-91; O'Connor, *The Parnell Movement, with a Sketch of Irish Parties since 1843* (New York, 1890); Davitt, *The Times-Parnell Commission*: Speech (London, 1890); Larkin, *Parnell and the London Times* (Boston, 1890); MacDonald, *Diary of the Parnell Commission* (London, 1890); *Memoir of Charles Stewart Parnell*, with a biographical [illegible] by Walsh (New York, 1892); Moore, *Parnell and His Island* (London, 1887); O'Brien, *Life of Charles Stewart Parnell* (London and New York, 1898); O'Shea, *The O'Shea-Parnell Divorce Case* (Boston, 1891); Mahaffy, *Lives of Parnell* (New York, 1886); Sherlock,

Life of Parnell (Dublin, 1887); Clayden, *England Under Lord Beaconsfield* (London, 1880); *England Under the Coalition*, etc. (ib., 1892).

PARNELL, Henry Brooke, First Baron Congleton (1776-1842). A British politician, born in Ireland. He studied at Eton and at Trinity College, Cambridge, and in 1797 entered politics as a member of the Irish House of Commons. In 1802 he was elected to the British Parliament for Queen's County, which, with an interval of four years (1802-06), he continued to represent until 1832, when he declined to stand again. The next year he was elected from Dundee, which he continued to represent from that time until his elevation to the House of Lords as Baron Congleton of Congleton in 1841. He became Secretary of War in Lord Grey's Cabinet in 1831, but was dismissed the next year for refusing to support the Ministry on the Russo-Dutch War question. His chief interest was in financial and agrarian subjects, and in 1838 he strongly urged the abolition of the corn laws. He wrote a number of works, including *Observations Upon the State of Currency of Ireland* (1804; 3d ed. 1804); *An Historical Apology for the Irish Catholics* (1807); *Treatise on the Corn Trade and Agriculture* (1809); *On Financial Reform* (4th ed. 1832); and *A Treatise on Roads* (2d ed. 1838).

PARNELL, Thomas (1679-1718). An Anglo-Irish poet, born in Dublin. He graduated at Trinity College, Dublin, and was ordained deacon, though under the canonical age. In 1706 he was appointed Archdeacon of Clogher; in 1713, prebendary to Saint Patrick's Cathedral, Dublin; and in 1716, Vicar of Finglas. He contributed to the *Spectator* and *Guardian*, and was the associate of Swift, Pope, Arbuthnot, and Gay, in the 'Scriblerus Club.' On the fall of the Whig Government, near the close of Anne's reign, he went over to the Tories, and stood in high favor with the Oxford Administration. But his prospects of advancement from that quarter were destroyed by the overthrow of the Tories on the death of the Queen. His disappointment at not obtaining better promotion, and the death of his wife (1711), threw him into deep melancholy, and he is said to have hastened his death by intemperance. He died at Chester in October, 1718. Besides the occasional papers written for Addison and his share in *Scriblerus*, Parnell helped Pope in the translation of the *Iliad*, and contributed to the first volume an *Essay on the Life, Writings, and Learning of Homer* (1715). His poems were collected by Pope in 1721. The volume contains twenty poems, among which are *The Hermit*, *A Night Piece on Death*, and *A Hymn to Contentment*. On these poems Parnell's reputation chiefly rests as a fluent and graceful verse-maker in the manner of Pope. They also point forward to the next generation—to Collins and Goldsmith. In 1758 appeared the *Posthumous Works of Parnell*. The volume adds nothing to his fame. Consult the *Life of Parnell* by Goldsmith, and the edition of Parnell's poems by Aitken in the Aldine series (London, 1894).

PARNY, pär'nē'. Evariste Désiré Desforges, Vicomte de (1753-1814). A French poet, born in the Isle of Bourbon. In his childhood he went to Paris, became a soldier, and in 1773-75 he revisited his native land and there loved a Creole whose praises he sang in the *Poésies érotiques* (1778). His later epics have less literary merit. They are frivolous and obscene. Of these, *La guerre des dieux anciens et modernes* (1796) is characteristic. His *Works* were published at Paris in 1808 in five volumes. The latest edition of his *Poésies complètes* appeared in 1887.

PARODY (Lat. *parodia*, from Gk. *παρωδία*, parody, from *παρα*, *para*, beside, beyond + *ᾠδή*, *ōdē*, song, ode, from *ἀείδειν*, *aeidein*, *ᾄδειν*, *adein*, to sing). As understood by the Greeks in early times, a parody was a comic imitation of an epic poem or of some part of it. The rhapsodists, in reciting the *Iliad* or the *Odyssey*, were accustomed, it is said, to throw in humorous passages of their own, composed in the style and metre of the original, but on a trivial subject. From this use the term was extended to the comic imitation of any poem, and afterwards to the comic imitation of any variety of prose, such as history and fiction. Parody, like travesty, is a form of burlesque. The essence of burlesque is the treatment of a light theme in the style appropriate to a serious work. Such, for example, is Chaucer's *Nun's Priest's Tale*, wherein the hubbub caused by Master Reynard in the widow's household is described in language suggestive of the fall of Troy. The humor lies in the contrast between subject matter and the treatment of it. In the travesty, such as the clever *L'Enéide travestie* of Paul Scarron, the characters of the original are turned to a humorous account by some change in the incidents that results in a debasement of the original theme. In the parody, the theme and characters are greatly modified or completely changed, but the style of the original is closely followed in those peculiarities that easily lend themselves to ridicule.

Though the word parody has come to us from the Greeks, it is not to be supposed that they were the first people to feel the impulse toward this kind of satire. Parody belongs to the folk literature of many and perhaps all races. In very early literary stages, writers have laid hold of their legal and religious phrases for giving a humorous turn to the common affairs of life. All that can be said is that the parody as a distinct literary type of satire has been handed down from the Greeks, giving form to the folk parodies of the Western nations. The first Greek parodist, according to Aristotle, was Hegemon of Thasos (fifth century B.C.), who gained a prize at the Athenian games with his *Gigantomachia*, or *Battle of the Giants*. By others the invention of the form has been ascribed to Hipponax (fifth century B.C.). But these are doubtful traditions. At any rate, the best extant parody of the epic among the Greeks is *The Battle of the Frogs and the Mice*, running closely on the lines of a Homeric combat, and dating from the second or the third century before Christ. At a later period great renown was won, it is said, by a certain Œnonas, a Greek born in Italy, who burlesqued the public reciters of Homer by transforming Polyphemus into a sentimental lover, and by giving Ulysses the speech of the common people. The great master of parody was Aristophanes, into whose comedies were taken over whole passages of Euripides and many current phrases for the purpose of ridicule. Aristophanes was followed

by Lucian, who in *The Dialogues of the Gods* freely employed the language of Homer, and in *The True History* built up an extravagant romance on incidents from the *Iliad* and contemporary tales of adventure. That the Romans were fond of parody is known from Cicero, who in his *De Oratore* enumerates its several kinds. Catullus was a favorite with the parodist, and Vergil did not escape.

Among the Romans are found the first parodies of the legal testament, or will. It was a custom, as early as the time of Julius Cæsar, for men to satirize their enemies by sarcrilous remarks about them in their wills. Out of the practice seems to have grown the humorous testament, in which some animal, a pig or an ass, bequeaths at death his property or qualities to posterity. These animal testaments, of which the earliest one extant goes back to the third century of our era, spread through the Latin races, appearing in French, Spanish, and Portuguese during the early Renaissance. Akin to them are the many imaginary testaments written on various occasions in later times. A fine specimen is *The Will* by John Donne, the Elizabethan poet. Closely related to the humorous testament is also the parody on the epitaph, which goes back to the Middle Ages. This kind of satire is seen in its perfection in the *Ballade des pendus* of François Villon, composed in anticipation of the gallows. Indeed, both the Lesser and the Greater Testament of Villon are parodies so excellent in their kind as to form a type. Almost equally famous is Goldsmith's *Retaliation* on the imagined death of his friends, including Burke, Garrick, and Reynolds.

For centuries the most fruitful source of parody was the Bible and the liturgy of the Christian Church. This was, of course, in line with the work of Lucian, though it was at first in no direct way connected with him. From the twelfth century onward, increasing greatly during the Reformation period, flourished parodies of the mass, the creed, the litany, the paternoster, and prayers and hymns to the Virgin. They were sometimes written in Latin, and at other times in the vernacular speech. In *Cynthia's Revels*, Ben Jonson introduces a light parody of the litany; and Lord Somers, who framed the *Declaration of Rights*, parodied the first four chapters of Saint Matthew. In 1817 William Hone, a London author and bookseller, was prosecuted for publishing parodies on the litany, the Athanasian creed, and the catechism, which he had employed for political satire. These are but a few examples taken from a class numbering hundreds.

The purely literary parody, aiming at good-natured banter, though not unknown to the ancients, is mainly a modern development from the harsh invective of the earlier times. It has long been expected that a popular poet or novelist will have his peculiar style and way of viewing things held up to ridicule. So kindly is this ridicule that not even the most sensitive author can receive other than pleasurable emotions from it. Shakespeare amused his audiences with the rant of the contemporary drama and the euphuism of John Lyly, and evidently was not hurt when friends like Beaumont and Fletcher paid him in his own coin. In more than one instance Shakespeare even parodied himself. The bombast and nonsense of Dryden's tragedies received its just castigation in the Duke of Buckingham's *Rehearsal*. Among the parodies of Milton the *Splendid Shilling* of John Phillips (died 1707) is still reckoned the best, although the almost contemporary *Tunsonia Burn*, now easily accessible in the works of Lady Winchelsea (1903), is almost as good. Passing by Gray, Goldsmith, and Cowper, each of whom had his parodist, we come to the nineteenth century—the age *par excellence* of parody. The first romantic group of English poets, including, among others, Wordsworth, Keats, and Shelley, were especially exposed to ridicule. Then came Tennyson and Browning with marked mannerisms, and finally the so-called Pre-Raphaelites, like Rossetti, William Morris, and Swinburne, with their florid imaginations, distorted female figures, and unreal landscapes. There could be no finer material for the parodist. In their *Rejected Addresses* (1812) Horace and James Smith burlesqued deliciously Wordsworth, Southey, Byron, and Scott. Following in the line of the Smiths are R. H. Barham's *Ingoldsby Legends* and the *Bon Gaultier Ballads*, the joint work of W. E. Aytoun and Theodore Martin. Among other clever verse-parodists were Thomas Hood, W. M. Thackeray, C. S. Calverley, Lewis Carroll, Sir Frederick Pollock, J. K. Stephen, and the numerous contributors to *Punch*, who have closely watched for absurdities of sentiment and style. From this list should be selected Calverley as undoubtedly the most felicitous parodist in the whole range of English literature. Especially successful was he in imitating Tennyson's *Brook* and Browning's *Rosny and the Rook* in *The Wanderers* and *The Cock and the Bull*. And the eccentricities of the Pre-Raphaelites are finely exaggerated in the *Ballad*.

The English novel began its career with parody. Richardson had no sooner published *Pamela* than humorous continuations were placed upon the market. All of them are now forgotten except Fielding's *Joseph Andrews*, which begins with ridicule of Richardson's point of view and a close parody of his epistolary style. Sterne was likewise the sport of a score of humorists. Before publishing *Vanity Fair*, Thackeray paid his compliments to Bulwer, Disraeli, Lever, and G. P. R. James, and afterwards to Scott. The mine opened by Thackeray in these *Burlesques* was further worked by Bret Harte in two series of *Condensed Novels* dealing with the older novelists, and Mrs. Humphry Ward, Anthony Hope, Conan Doyle, Hall Caine, and Kipling. In like manner Owen Seaman in *Borrowed Plumes* (1902) burlesqued Mrs. Craigie, Miss Fowler, Marie Corelli, George Meredith, Maurice Hewlett, Henry James, and other novelists of the day.

Parody has been considerably cultivated by American writers with at least fair success. Of colonial parodists the most important is doubtless Joseph Green of Boston, the witty rival of Mather Byles, the punning parson. The Revolutionary satirists naturally made use of parody, a good illustration being John Witherspoon's parody of the *Petition* of Rivington, the Tory printer. After the Revolution the 'Hartford Wits' essayed parody and the mock-heroic in *The Echo* and *The Anarchiad*. The absurdities of the Della Cruscans and the pretensions of the new Democratic-Republican Party furnished materials to parodists and satirists, but the first

elaborate parody of real consequence, Irving's *Knickerbocker's History of New York*, changed under its author's hands into a masterpiece of humorous narration. With the next generation came authors original enough to be parodied not only in America, but in England; for example, Willis, Longfellow, and Poe. It was even found worth while to parody, in a volume modeled on the *Rejected Addresses*, versifiers whose names are now scarcely remembered. The Civil War gave an impetus to the writing of parodies. Some clever ones are to be found in the works of professed humorists like D. R. Locke ("Petroleum V. Nasby") and R. H. Newell ("Orpheus C. Kerr"), but the most important and sustained is Richard Grant White's *New Gospel of Peace*. Of recent years Walt Whitman is naturally the writer who has best lent himself to parody. Bret Harte (q.v.) and Bayard Taylor, in *The Echo Club and Other Literary Diversions*, are probably the most important writers of parody with regard to both quantity and quality. For the early history, consult, with its bibliography, Delepierre, *Essai sur la parodie* (London, 1871). A popular history of parody with examples from modern literature is given by Martin in *On Parody* (New York, 1896). For a larger collection, consult Hamilton, *Parodies of the Works of English and American Authors* (London, 1884-89). Some good specimens of recent verse-parody may also be found in Miles, *The Poets and Poetry of the Century*, vol. ix. (ib., 1897), and in other anthologies. See also the articles on the writers here mentioned, and the article on BURLESQUE.

PAROLE (Fr. *parole*, word, from Lat. *parabola*, comparison, speech, parable). When a military or naval officer is released from close confinement, or allowed any extraordinary privilege on the sole security of his word of honor, he is said to be on parole. On guard, or any other post, where precautions against an enemy are necessary, a certain word is previously agreed upon, which is known only to the officers of the guard and of the day, and such other officers as for special reasons may be intrusted with it. It differs from the countersign (q.v.) in that the latter is given to all sentries and men of the guard, while the parole is confided entirely to officers of the guard and those in similar authority.

PAROQUET. See PARRAKEET.

PA'ROS (Lat., from Gk. Πάρος). An island of the Cyclades, in the Grecian Archipelago. It is situated west of Naxos, from which it is separated by a channel from four to six miles wide. Greatest length, fifteen miles; greatest breadth, nine miles; area, about ninety-five square miles. Population, in 1896, 7740. The island is chiefly a mountain mass, rising in the centre in the ancient Marpessa, now Mount Saint Elias, to a height of nearly 2500 feet. In the valleys the vine and grain are cultivated, but the chief importance of the island in ancient times was due to the marble, and especially the highly esteemed *Lychnites*, which was much sought by sculptors. Parikia, on the west coast, on the site of the ancient Paros, is the principal town. Ancient tradition attributed the early colonization of the island to Cretans, who called it Minoa; later it was settled by Ionians. It early enjoyed prosperity from its marble and its numerous sculptors. Later it submitted to Persia, and was unsuccessfully attacked by Miltiades after the battle of Marathon. After the Persian wars it joined the Delian League, and shared the fortunes of the neighboring islands. Like other Cyclades, it passed under the rule of the Ptolemies of Egypt, and in B.C. 197 was presented to the Athenians by Rome. Since then it can scarcely be said to have had a separate history. It was celebrated in literature as the native place of the poet Archilochus, and is also known from the discovery of the famous Parian Chronicle. See ARUNDEL MARBLES.

PAROTID GLAND. See SALIVARY GLAND.

PARQUETRY (Fr., inlaid flooring, from *parqueter*, to floor with small pieces of wood, from *parquet*, inlaid floor, diminutive of *parc*, inclosure, park). A kind of wood mosaic used for flooring and sometimes for wainscoting or furniture. In the more elaborate kinds of parquetry, veneers are used, but it is much more generally composed of blocks of wood often of different colors, laid down so as to combine and form a geometric pattern. The patterns are usually bounded by straight lines. The pieces are laid flush and flat on the upper surface. For this purpose the edges are usually grooved so as to fit snugly into each other, though other methods of laying are also followed.

PARR (so called probably from the parr-marks or cross-bars on the sides). A young salmon before its first migration to the sea, and when its sides still show indistinct bars. Compare SMOLT; see SALMON.

PARR, CATHARINE (1512-48). The sixth and last Queen of Henry VIII. of England. She was the daughter of Sir Thomas Parr, of Vendal, Westmoreland. Married first to Lord Burgh, and afterwards to Lord Latimer, she was wedded, not without misgivings, to Henry VIII., on July 12, 1543. She was distinguished for her learning and knowledge of religious subjects. Her influence was for good; she persuaded Henry to restore the right of succession to his daughters; wished to educate them and Prince Edward, and interested herself on behalf of the universities. In 1544, during the absence of Henry at the siege of Boulogne, she acted as Regent of the kingdom. After Henry's death she married (1547) Sir Thomas Seymour, and died after childbirth the following year.

PARR, Mrs. LOUISA (maiden name TAYLOR) (c.1848?—). An English novelist, born in London. She passed her early life in Cornwall. Marrying a physician in 1869, she settled at Kensington. Before this she had written a story entitled *How It All Happened* (in *Good Words*, 1868). This graceful story, translated into French, appeared also in the *Journal des Débats*. Her first three-volume novel, *Dorothy Fox* (1870), was well received. But she first gained her audience with *Adam and Eve* (1880), which depicted with faithfulness the quaint fishing village of Polperro in Cornwall. Among subsequent novels are *Loyalty George* (1888); *The Squire* (1892); and *Can This Be Love?* (1896).

PARR, SAMUEL (1747-1825). A once notable English scholar, born at Harrow-on-the-Hill. He was sent to Emanuel College, Cambridge,

in 1765; but the death of his father, two years afterwards, compelled him to withdraw and to accept an assistant-mastership at Harrow, where he remained five years. In 1776 he was appointed master of Colchester School, where he was ordained priest, and obtained the curacies of Hythe and Trinity Church. Next year he became master of Norwich School; but in 1786 settled at Hatton in Warwickshire, where he spent the rest of his life. In 1787 he published an edition of Bellenden, to which he prefixed his celebrated preface, which is as remarkable for its uncompromising advocacy of Whig principles as for the scrupulous Ciceronianism of its Latinity. Parr was a man of vast learning, but his scholarship was not of high order. Consult De Quincey's essay, *Dr. Samuel Parr on Whiggism in Its Relations to Literature*.

PARR, THOMAS (c.1483-c.1635). An English centenarian, known as 'Old Parr.' In 1635 he was brought by the Earl of Arundel to London and presented at Court as then 152 years of age. He was long a favorite chap-book character, but assertions of his extreme age have been investigated and contradicted by W. J. Thoms and Sir G. C. Lewis. The chief source of information concerning Parr is a curious pamphlet by John Taylor, entitled *The Olde, Olde, Very Olde Man* (1635).

PARRAKEET (Fr. *perroquet*, from Sp. *periquito*, diminutive of *perico*, parrot, from *Pedro*, Lat. *Petrus*, Gk. Πέτρος, Peter, from πέτρος, rock; also explained as from It. *parrochetto*, diminutive of *parocco*, parish priest, jestingly applied to the bird). Any of many small kinds of parrots, especially the long-tailed East Indian and Australian species of the genus Palæornis and its allies. The American parrakeets are chiefly of the genus Conurus, one species of which is found within the limits of the United States, and not elsewhere. At the beginning of the nineteenth century the Carolina parrakeet (*Conurus Carolinensis*) was found throughout the Eastern and Central United States as far north as Nebraska, Wisconsin, and central New York. It was not merely a summer visitor, but occurred also in winter, so that it was remarkably hardy for a parrot. At the beginning of the twentieth century the species was almost extinct, and survived only in the most inaccessible parts of Florida and Indian Territory. It is a beautiful bird, and also noisy, gregarious, and tame, so that it has been an easy victim. It is a trifle more than a foot long, bright green in color, with the head and neck yellow, forehead, cheek, and bend of wings orange. It feeds on seeds, nuts, and so on, and is very destructive to fruit. On account of the damage it did in orchards, it was ruthlessly killed in early days. Its nesting habits have never been authentically described, and there is some dispute as to whether its eggs are laid in a hole in a tree as is customary with parrots. One of the most beautiful groups, combining gracefulness of form with splendor of plumage, is that to which the Alexandrina or ring parrakeet (*Palæornis Alexandri*) belongs. It is about the size of a common pigeon, green, with a red collar, and is a native of the East Indies. It is said to have been brought to Europe by Alexander the Great's expedition to India, and to have been the first parrot known to the Greeks and Romans, by whom it was highly prized, as it still is, not only for its beauty, but for its docility and its power of imitating human speech. Immense flocks live in some of the cocoanut groves of Western Ceylon, and fill the air with deafening screams. The ring parrakeet has many congeners, natives chiefly of the East Indies, which exhibit much variety of splendid plumage, among which the East Indian rose-ringed *Palæornis torquatus* is one of the most familiar; its general color is green, the neck of the male ornamented with a rose-red, black-edged collar.

Much like them in length and form of tail, but with longer and stronger legs, is the small ground-parrakeet (*Pezoporus formosus*) of Australia and Tasmania. This bird inhabits thickets and runs much on the ground, but occasionally takes a short low flight. It makes no nest, but lays its eggs in a hole in the ground. Its colors, dark green above, and yellowish below, are less brilliant than in many of the parrot tribe, but the bird is finely marked and mottled. Its flesh has a very strong game flavor. There are numerous other Australian species, distributed in several genera, some of which exhibit great splendor of plumage. Most familiar is the grass, shell, or zebra parrakeet (*Melopsittacus undulatus*), a very beautiful little bird, which has long been one of the favorite cage-birds in all parts of the world, and often sells under the dealers' name 'budgerigar' (q.v.). It is small, slender, and long-tailed. It has a yellow head, with three black cheek-spots surmounted by a blue patch; the back is yellow with black transverse markings; the wing-quills brown with green outer webs and yellow margins; the rump and under parts green, the tail green, bounded with yellow, but with the two central quills blue. (For illustration see Plate of PARROTS.) In the vast inland plains of Australia this parrakeet is to be seen in flocks of many hundreds feeding on the seeds of the grasses, which afford food also to many other small 'grass parrakeets,' such as those of the genus Euphema.

PARRAL, pär-räl', or HIDALGO DEL PARRAL. A city of the State of Chihuahua, Mexico, situated on the Parral, 120 miles south of Chihuahua (Map: Mexico, F 4). The town possesses very old and productive silver mines that are now in the hands of Americans. It is in the midst of the wine-making district of Mexico, and is noted for its fine aguardiente. A United States consular agent is stationed here. Population, 6000.

PARRAMATTA, pär'ä-mät'tä, or **PARAMATTA**. A town of New South Wales, Australia, pleasantly situated near the western extremity of Port Jackson, on a small river of the same name, 14 miles west of Sydney, with which it is connected by steamer and railway (Map: New South Wales, F 3). The houses are mostly detached, and the streets are wide and regular, the principal one being about a mile in length. It is the centre of an extensive fruit-growing district, and has important manufactures of 'colonial tweeds,' 'Parramatta cloths,' and salt. The great reservoir of the Sydney water-works is located here. Formerly called Rosehill, Parramatta is, with the exception of Sydney, the oldest town in Aus-

tralia. The first grain raised in the colony was grown here, and the first grants of land made. Population, in 1891, 11,700; in 1901, 12,568.

PARRAS DE LA FUENTE, pär'räs dā lā fwān'ta. A town of the State of Coahuila, Mexico, situated near the east shore of Lake Parras (Map: Mexico, H 5). The town lies in a fertile valley, and is surrounded by orchards and vineyards. Its chief manufactures are wines and brandies, for which the town is celebrated. Population, in 1895, 8326.

PAR'RATT, WALTER (1841—). An English organist and conductor, born at Huddersfield. His first organ appointment was near Huddersfield (age eleven). The next year he was appointed organist of Saint Peter's Church, London, and studied with George Cooper. He also occasionally accompanied an anthem at the service in Saint Paul's Cathedral. In 1854 he returned to Huddersfield, where he was in great request for organ recitals throughout the north of England. In 1861 he accepted an appointment at Worcester, where he was also private organist to the Earl of Dudley. In 1872 he became organist of Magdalen College, Oxford. On the retirement of Sir George Elvey as the organist of Saint George's Chapel, he was appointed to fill the vacant position. He was knighted by the Queen in 1892, and received the appointment of private organist to Her Majesty, and the following year became master of the Queen's music, continuing those offices under King Edward VII. He is more famous for his work in that direction than for his compositions, which latter, however, while not numerous, are of a high order of merit. They include music to the *Story of Orestes*, many anthems and services, and a few songs. He edited *Madrigals* for the Bach Choir, and *Choral Songs by Various Writers and Composers* (1889), and contributed ten important articles to Grove's *Dictionary of Music and Musicians* (1879-89).

PARRHA'SIUS (Lat., from Gk. Παρράσιος). One of the greatest painters of ancient Greece, the son of Evenor, himself an artist. He was a native of Ephesus, but, like his elder contemporary Zeuxis, practiced his profession in many places, and seems to have received Athenian citizenship as a reward for his picture of Theseus, since later writers sometimes call him an Athenian. He lived near the end of the fifth century B.C., but exact dates are not known. Certainly apocryphal is the story of Seneca that for his painting of Prometheus he tortured a captive from Olynthus, as the artist could scarcely have been living at so late a date (B.C. 347) if he were a celebrated painter during the lifetime of Socrates, over fifty years before. (Cf. Xenophon, *Memorabilia* iii. 10.) His art is known to us only from ancient criticism, and chiefly from a passage in Pliny, *Hist. Nat.*, xxxv., 67, where he is praised as the first to introduce accurate proportions into painting, and as especially successful in his drawing and rendering of contours. It seems that he was the first successfully to employ light and shade in such a way as to suggest the round, as distinguished from the relief. His painting of the Athenian Democracy (*Demos*) was held to express in a wonderful way the variety of disposition which marked that very variable person. Other works of his were a "Hermes," believed to be his own portrait; a "Heracles," which claimed to show the hero as he had appeared to the artist in a dream; a "Naval Commander in Full Armor"; "Ulysses Feigning Madness"; "Æneas, Castor, and Pollux"; "Dionysus and Virtue"; "Meleager, Heracles, and Perseus"; "Thracian Nurse with a Child in Her Arms"; "Priest with a Child Bearing Incense"; "Two Boys"; "Healing of Telephus"; "Contest for the Armor of Achilles"; "Philoctetes on Lemnos"; and others. For recreation he is said to have painted licentious little pictures, one of which, "Meleager and Atalanta," was a great favorite of the Emperor Tiberius, who chose it rather than a million sesterces.

PARRICIDE (Lat. *parricida*, OLat. *paricidus*, murderer of his parent, of a magistrate, or of a free citizen, assassin, probably from *par*, equal + *cædere*, to kill; associated in popular etymology with *pater*, father). One who kills his father, or a man who stands in the place of a father, as a father through adoption. The term is derived from the Roman law, where the crime of *parricidium* included the murder of many near relatives besides the father, as a grandfather, son, brother, sister, and others. By the *lex Pompeia de Parricidiis* (B.C. 52), the murder of an ascendant, as a father or grandfather, or a son, was punished in most severe manner, the parricide being sewed up in a leather sack, along with a live dog, viper, cock, and ape, and cast into the sea or a near-by river. In England and the United States the punishment of a parricide does not differ from that of a murderer of a stranger. See MURDER. Consult the authorities referred to under CRIMINAL LAW; CIVIL LAW.

PAR'RIS, SAMUEL (1653-1720). A New England clergyman. He was born in London, went in youth to Massachusetts, and studied at Harvard College, but did not graduate. After being a successful merchant in Boston, he entered the ministry, and was pastor of the church at Danvers, Mass. (then a part of Salem), in 1689-96. He is remembered from the fact that the delusion of Salem witchcraft originated in his family in 1692, his daughter and his niece accusing Tituba, a South African slave living as a servant in the family, with bewitching them. Mr. Parris beat her and compelled her to confess herself a witch. The delusion and persecution thus commenced lasted sixteen months. Mr. Parris having been a zealous prosecutor in the witchcraft cases, his church brought charges against him. He acknowledged his error, but was dismissed. He preached afterwards at Stow, Concord, and Dunstable. Consult his *Life* by Fowler (Salem, 1857).

PAR'RISH, EDWARD (1822-72). An American pharmacist, born in Philadelphia, and member of a distinguished family of physicians. He was principal of the Philadelphia School of Pharmacy, where he became professor of materia medica in 1864. He is best known through a non-official preparation, the compound syrup of phosphate of iron, popularly known as Parrish's chemical food. He published *Practical Pharmacy* (Philadelphia, 1856; 5th ed. 1884); *The Phantom Bouquet* (Philadelphia, 1863); and

1 LESSER LEMON CRESTED COCKATOO (CACATUA SULPHUREA) ½ NATURAL SIZE
2 PENNANT'S OR BLUE-TAILED PARRAKEET (PLATYCERCUS PENNANTI)
3 GRAY-HEADED MADAGASCAR LOVE BIRDS (AGAPORNIS CANA)
4 FORBES'S ... PARRAKEET ...

Education in the Society of Friends (Philadelphia, 1866).

PARRISH, Maxfield (1870—). An American painter and illustrator, born in Philadelphia. He was a pupil of the Pennsylvania Academy of Fine Arts, and of Howard Pyle. He became widely known by his decorative posters and designs for magazine covers. His work is usually in the flat tints used by a number of the modern illustrators, and is remarkable for strong, delicate line, clever gradation of tone, and the rich detail of the background. His illustrations, which include those for *The Golden Age* of Kenneth Grahame, *Mother Goose in Prose*, and *Knickerbocker's History of New York*, are full of charm and humor. Among his paintings are "The Sandman" and "The Bulletin Board." He became a member of the Society of American Artists in 1897, and received honorable mention at the Paris Exposition of 1900.

PARRISH, Stephen (1846—). An American landscape painter and etcher, born in Philadelphia, Pa. He first exhibited at the Pennsylvania Academy in 1878, and a year afterwards at the National Academy in New York City. Among his pictures are "Low Tide," "In Winter Quarters," "Evening," and "The Road to Perry's Peak." His subjects are usually large, open expanses of country—often winter scenes—treated with much poetic feeling. His etchings include the series of plates, "Cape Ann to Marblehead," and many other American seaboard scenes.

PARROCEL, pȧ'rō'sĕl'. A family of French painters, the first of whom was Barthélemy (c.1600-c.60), a painter of religious subjects. The most important was Joseph (1646-1704), the battle painter, born at Brignolles. He studied under his father and elder brother, Louis, and afterwards was the pupil of Le Bourguignon in Rome. He was made a member of the Academy in 1676, his reception picture being "Louis XIV. Repulsing a Sortie of the Maestricht Garrison" (Louvre). He is said to have known nothing of actual soldiering, but he had a vigorous brush and considerable skill in composition. There are also pictures by him at Versailles, and in Notre Dame and the Invalides, Paris. He left several etchings after his own designs, which include forty-eight scenes from the life of Christ. Other painters of this name were his son Charles (1688-1752), a battle painter; his nephew, Pierre (1670-1739), whose subjects were mostly religious; and Ignace François (1704-81), son and pupil of Pierre, an historical and genre painter.

PARROQUET. An alternative spelling for 'parrakeet' (q.v.). In the United States the group is represented by the Carolina parroquet or parrakeet.

PARROT (probably from Fr. *Perrot*, *Pierrot*, diminutive of *Pierre*, Peter). A bird of the group Psittaci, which is related to the cuckoos and plantain-eaters, and includes two families, the Psittacidæ and Trichoglossidæ, together numbering about 500 species. Most of them are natives of the tropics, and especially of the Australian and Malayan regions, and about 100 species occur in New Guinea alone. South America has about 150 species, and Africa and Southern Asia the remainder. Few inhabit or even enter the temperate zone, the most northerly one, perhaps, being the now nearly extinct Carolina parrakeet (q.v.) of the United States. The determining feature in the family is the beak, which is short, stout, and greatly arched, the upper mandible hooking over the lower, and movably hinged to the skull. The feet are short and strong, and the toes are two before and two behind. The wings are likely to be rather short and in some groups rounded; and the tail may be short and broad as in the true parrots, or very long and pointed, as in the parrakeets, noticeably broad in others, and so on. Most parrots are gaudily colored, but some are soberly clad; and there is likely to be a crest very prominent in the cockatoos and less so in some others—or other modifications of the feathers of the head, as in the facial disks of the owl parrots or kakapos (q.v.). The sexes are usually much alike.

Most parrots are forest-birds, although a few are of terrestrial habits and are styled ground-parrots, and a few others, like the grass-parrakeets, inhabit grassy or bushy plains. As a rule, also, they are gregarious, and many species go in large flocks. Their food with few exceptions is vegetable—plantains, papaw-apples, figs, and tamarinds being varied by flowers, buds, leaves, palm-nuts, and other hard fruits, grass-seeds, and grain. This supplies so much moisture that little drinking seems necessary. Exceptional foods are the bulbs and tubers for which cockatoos dig, while some species search the bark of trees for insects, or extract honey and insects from flowers with their brush-tipped tongues. (See Lory.) Lastly, the kaka (q.v.) has acquired a taste for flesh. They gather this food by climbing about the branches like the nimblest of acrobats, using their beaks freely in support of their bodies, and manipulating their food with their claws as no other bird ever does.

The voices of parrots as a rule are harsh, and the great macaws and cockatoos scream most discordantly. Some, however, utter low and sweet twittering notes. Many have great facility in imitating other sounds or human speech, and some learn to articulate words and phrases with much distinctness, if given patient training. There is a popular notion that this process may be aided by slitting the tongue, a practice as useless and foolish as it is barbarous. It is not certain that the tongue has anything more to do with the enunciation of parrots than in the case of other birds, where it plays no part in utterance. The tongue is always large, round, and fleshy. In the subfamily Nestorina (the kakas) it is fringed; and in lories it has a brush of hairs toward the tip.

The typical, and perhaps the best-known, parrot is the African gray parrot (*Psittacus erithacus*) of equatorial Africa, which is ashy gray, with black wing-quills, a red tail, and whitish, naked face. It is in high esteem among most of the African tribes, who rear it from the nest as a house pet, enjoy its flesh, and seek its feathers as ornaments, some setting apart the red tail feathers for their chiefs as insignia of rank. Long ago these parrots were carried to Europe, and afterwards to all parts of the world, and have shown themselves not only hardy, long-lived, and affectionate, but the clearest talkers of the whole tribe. A closely allied but much darker West African species is made

to talk at all. In their native wilds these parrots go about in flocks during the day, and return at night to certain 'roosts.' They eat various fruits and nuts, especially palm-nuts. They breed in holes in trees, often in companies, and aid one another in defending their homes. All parrots nest in holes in trees except a few aberrant ones, like some in New Zealand, which lay their eggs in holes or hollows of the ground or among rocks. All lay white eggs. Fossil representatives of this tribe carry its history back to the Lower Miocene Age.

Bibliography. The latest monographer of the parrot family is Count Salvadori. For his papers and those of other systematic ornithologists, consult Newton, *Dictionary of Birds* (New York, 1893); also Evans, *Birds* (ib., 1900). For descriptions and treatment of these birds as pets, consult Greene, *Parrots in Captivity* (London, 1884), three royal octavo volumes with colored plates.

See Plates of Parrots, Cockatoos and Macaws.

PARROT-FISH, or Loro. Any of many species of the family Scaridæ, particularly of the genus Scarus. The form is oblong and massive, with large scales. They are fishes of brilliant colors in general, and some have wonderful splendor, and have received their name partly on this account and partly on account of a fancied resemblance in their jaws to a parrot's bill. They are mostly herbivorous, some feeding on corals, and are not good food fishes. Most of them are natives of the tropical seas. One species in the Mediterranean (*Scarus Creticus*) is the 'scarus' of the ancients, about which many wonderful stories were told as to its love, its wisdom, its ruminating, etc. Several species inhabit tropical American waters, and are known in the West Indies as 'loros,' 'viejas' (i.e. old wife), 'guacamaias,' etc.

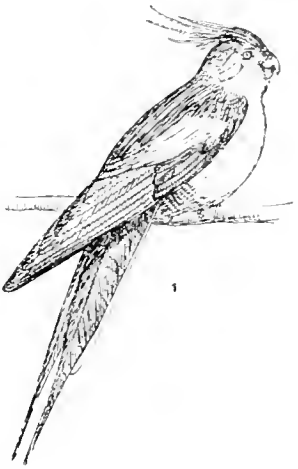
PAR'ROTT, Robert Parker (1804-77). An American soldier and inventor of ordnance, born at Lee, N. H. He graduated at West Point in 1824, and was assigned to the artillery. Until 1829 he remained at the Military Academy as an instructor, then performed garrison duty for several years, and in 1836 took part in the operations against the Creeks. He was promoted to be captain on January 13th of that year, but resigned from the service in the following October to become superintendent of the West Point Iron and Cannon Foundry at Cold Spring, N. Y., a position which he held until 1867. While there he invented the famous Parrott cannon used by the Federal Army and Navy during the Civil War. Captain Parrott was first judge of the Court of Common Pleas in Putnam County from 1843 to 1847, and was superintendent of schools at Phillipstown from 1848 until 1856. For a description of the Parrott gun, see Ordnance.

PAR'RY, Charles Christopher (1823-90). An American botanist, born in Worcestershire, England. He was educated at Union College, and afterwards practiced medicine in Davenport, Iowa. His study of the botany of the district resulted in his appointment to the geological survey of the Northwest (1848), then to the survey of the Mexican boundary (1849-52), and he was successively botanist to the Pacific Railroad survey of the 35th parallel and to the Department of Agriculture from 1867 to 1871. His publications include: *Botanical Observations in Western Wyoming* (1874); *Botanical Observations in Southern Utah* (1875); *Revision of the United States Pacific Coast Species of Arctostaphylos* (1883); *Revision of the Genus Chorizanthe* (1884); and *The North American Genus Ceanothus* (1888).

PARRY, Charles Hubert Hastings (1848—). An English composer, born at Bournemouth. At the age of seven he was sent to a private school at Malvern. His earliest attempts at music, in the form of chants and hymn-tunes, date from this time. In 1860 he was sent to Twyford School, and took lessons from the village organist; while there he came under the influence of Samuel Sebastian Wesley, the organist of Winchester Cathedral. In 1861 he entered Eton. He studied composition under Elvey and often acted as composer, organist, or vocalist for the musical society of the college. In 1867 he entered Exeter College, Oxford, where he came under the notice of Sir John Stainer, and became the founder of the University Music Club. He obtained in 1874 his degree of master of arts, and took advanced study in music under Bennett and MacFarren, together with an extended course under Dannreuther. Upon leaving Oxford he was anxious to adopt the profession of music, but his family opposed the plan. After three years in a business house, however, he devoted himself entirely to music. His first success as composer was with his *Intermezzo Religioso* (1868). Other compositions include: *Prometheus Unbound* (1880); *Symphony No. 1 in G* (1882); *The Glories of Our Blood and State* (1883); the oratorio *Judith* (1888); *Ode on Saint Cecilia's Day* (1889); *The Lotus Eaters* (1892); and *Hypatia* (1893). He was appointed Choragus of Oxford University in 1883, and in the same year was granted the degree of musical doctor by Cambridge, followed in 1884 by Oxford, and in 1891, by Dublin. He was appointed director of the Royal College of Music in 1894, and was made a knight by Queen Victoria in 1898.

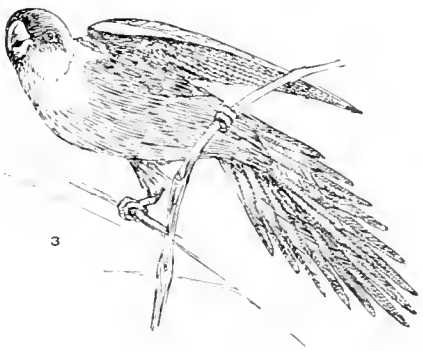
PARRY, Sir William Edward (1790-1855). A British Arctic explorer and naval officer, born at Bath, on December 19, 1790. He joined the British Navy as midshipman in 1806, rose to the rank of rear-admiral, was in the hydrographic service from 1823 to 1829, and retired from the navy in 1852. He is best known as an Arctic explorer. In command of the ships *Griper* and *Hecla* he left England in 1819 to seek the Northwest Passage. He passed up Baffin Bay, explored and named Barrow Strait, Prince Regent's Inlet, and Wellington Channel, and reached Melville Island in September of that year, having crossed longitude 110° W., thereby winning a reward of £5000 offered by Parliament. He returned to England in November, 1820, and published a narrative of his expedition. He sailed again in 1821 with the *Fury* and *Hecla* to make the Northwest Passage, and reached Repulse Bay, which he proved to be land-locked instead of a strait leading to the west as was supposed. He wintered on Melville Peninsula, where he made a study of the Eskimos, discovered Hecla and Fury Strait the next summer, but was baffled by ice and compelled to spend the succeeding winter at the east entrance to Hecla and Fury Strait. The expedition underwent many hard-

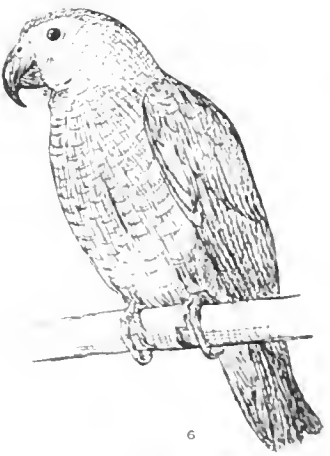
PARROT AND PARRAKEET

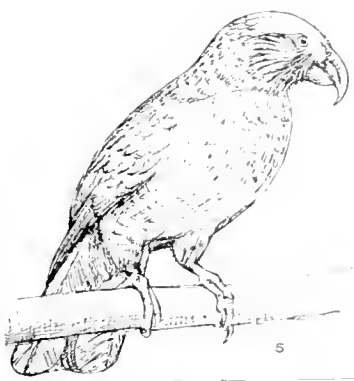

1


2


4


3


6


5

1. COCKATIEL (Calopsitta Novæ-Hollandiæ
2. ROSE-RINGED PARRAKEET (Palæornis torquata)
3. CAROLINA PARRAKEET (Conurus Carolinensis)

4. [illegible] (Psittacus [illegible])
5. KAKA (Nestor meridionalis)
6. AFRICAN GRAY PARROT (Psittacus [illegible])

ships and was so enfeebled in the following summer that it was compelled to return to England, where it arrived in October, 1823. In May, 1824, Parry left with the same ships to make another attempt to discover the long-sought passage, but after a winter in the ice and the loss of the *Fury*, the expedition returned home in October, 1825. Parry then obtained the Admiralty's consent to attempt to reach the North Pole by the Spitzbergen route. He sailed on the *Hecla* for Spitzbergen in May, 1827, left his ship in Truenberg Bay on June 21st, and started for the north with two boats, fitted with steel runners to serve as sledges, 28 men, and supplies for 71 days. The advance was extremely difficult, the party exchanging from floe ice to water several times each day, and the southward drift of the ice deprived Parry of many of his hard-won miles to the north. The highest point attained was in latitude 82° 45′ N., which secured for England a new record of highest latitude and remained the highest north for forty-eight years. Parry died on July 8, 1855, after serving two years as governor of Greenwich Hospital. His best-known books are *Journal of a Second Voyage for the Discovery of the Northwest Passage*, which appeared in 1824, and *Narrative of an Attempt to Reach the North Pole in Boats* (1827).

PAR'RY ISLANDS. A group of large islands in the Arctic archipelago of North America, lying chiefly north of the 75th parallel of latitude (Map: America, North, G 2). The chain extends westward from Baffin's Bay, south of Ellesmere Land, being bounded on the south by Lancaster and Melville sounds. The principal members of the group are North Devon, Grinnell Land, and Cornwallis, Bathurst, Melville, and Prince Patrick islands. All the islands are irregular in outline, with numerous fiords and headlands. The coasts are rocky and steep, while the interior is covered with glaciers. They are uninhabited, and their vegetation is very scanty, though sufficient in summer to support herds of reindeer and musk-oxen. One of the earliest explorers of the group was Parry, who wintered on Melville Island in 1819. The discoveries in these regions, however, were mainly accomplished during the search for Sir John Franklin.

PARSIFAL, pär'sē-făl. A festival music-drama by Richard Wagner. The outline of the music was finished in 1879, the orchestration in 1882, and the first performance was given in Bayreuth, July 26, 1882. The story is based upon the Arthurian legend of Perceval and the Holy Grail, and particularly on the metrical version by Wolfram von Eschenbach. (See PERCEVAL.) The scene is in or near the Castle of the Holy Grail (Monsalvat, Spain). The principal characters are: Parsifal; Amfortas, who has been one of the Knights of the Grail, but who has lost the Holy Spear, been wounded by it, and has fallen into the power of Klingsor, a magician hostile to the knights; and Kundry, one of the beautiful women through whom Klingsor hopes to gain authority over the knights (as he has over Amfortas) by tempting them to break their vows of chastity. In the first act the inexperienced Parsifal is brought to the castle by one of the knights, witnesses the adoration of the Grail, but does not appreciate its significance, and is cast out by the knights. In the second act Parsifal withstands Klingsor's various attempts to overcome him, even Kundry is unsuccessful, and he finally wins from the magician the Holy Spear and starts on his search for the Castle of the Grail, whose importance he now realizes. In the third act, after a lapse of many years, Parsifal meets Kundry and one of the knights. Kundry has repented, and after baptizing her Parsifal is led by the knight to the castle. There he heals the old wound of Amfortas by touching it with the Holy Spear (the only possible cure); Kundry dies in happiness, and Parsifal is hailed as King of the Knights of the Grail. See the article WAGNER, RICHARD.

PARSIMONY (Lat. *parsimonia*, *parcimonia*, frugality, from *parcere*, to be frugal, to spare; connected with *parcus*). THE LAW OF. The statement in explicit terms of the demand of thought that principles of explanation should not be unnecessarily multiplied.

PARSIS, pär'sēz, or **PARSEES** (Pers., Hind. *Pārsī*, Persian, fire-worshipers). The modern Zoroastrians, especially in India, where, in 1901, they numbered 94,190. Less than a hundred years after the Arab invasion in the seventh century, and the fall of the Iranian kingdom and faith, a considerable number of Zoroastrians left Persia to gain greater religious liberty, and moved as a community with their priests down to the city of Ormuz, on the Persian Gulf. After residing there some fifteen years, they determined to seek the shores of India, and they landed first on the island of Diu, off the coast of Kattiawar. Here they remained for nineteen years until circumstances brought them farther south. They landed in 716 at Sanjan, some distance to the north of the modern Bombay, and settled among the Hindus, after complying with certain simple regulations. In 775 a second band seems to have joined these pioneers, and together they formed a community, which flourished for more than five hundred years. In 1465 the Mohammedans who were invading India attacked the Parsis of Sanjan, who had made an alliance with their Hindu protectors. The allies were defeated, Sanjan was destroyed, and the Parsis were forced to seek refuge in the Bharbut hills, where they kept alive their sacred fire and preserved their ancient rites. In the sixteenth and seventeenth centuries the Zoroastrians spread quite widely through Gujarat, settling in Surat, Navsari, Bombay, and other places. The Parsi settlement in Bombay began as early as the time of the Portuguese occupation (1530-1661). The Bombay Presidency has remained the centre of the Parsi population of India, although representatives of the community are to be found as far northward as Peshawar, as far east as Calcutta, and as far to the south as Madras, or even Ceylon. Almost all the Parsis are well to do, and a large proportion of them wealthy. They are often called the Jews of the East.

The Parsis have in general remained faithful to the tenets of their ancient creed. But in consequence of emigration from Persia, and because also of their contact with the Hindus and others, some changes have crept into their customs. Nor have they kept free from sectarian controversy. As early as 1680 there is evidence of a vigorous dispute as to supremacy of position, between

the priests of Navsari and the original clerical leaders of Sanjan. Early in the eighteenth century another dispute arose with regard to the dating of the calendar, which in India gradually fell a month behind the Persian Zoroastrian calendar, because of failure properly to introduce the intercalary month. This resulted in dividing the Parsi community into two sects, Shenshahis and Kadmis. The Shenshahis adhered to their customary Indian reckoning of months, without the intercalation, but the Kadmis adopted the Persian reckoning with the month duly inserted; thus the Shenshahi calendar remains still a month behind the Kadmi. They are generally united on the main tenets with regard to their god Ormazd (q.v.), their prophet Zarathushtra (see ZOROASTER), and a belief in angels and archangels. They follow the same general rites, feasts, fasts, manners, and customs. In theology they are strongly monotheistic today. At present, however, a belief in the resurrection of the body seems less pronounced among them than their sacred texts would appear to warrant. As to the doctrine of spiritual authority, the infallibility of their Dasturs is unhesitatingly questioned by the less strict conformists, but all unite in acknowledging the religious leadership of those priestly heads.

If we may judge from the old Greek accounts of the Persian faith, the Parsis, from time immemorial, have kept up the idea of ceremonial purification. Scrupulous care is taken to preserve the elements, earth, fire, and water, from defilement, especially from dead matter. Nor would a strictly orthodox Parsi to-day spit into the fire or blow out a light, any more than in the days of Cyrus, although in practical matters they often have to make concessions, and Parsis may even serve in the fire department of Bombay. Many who are less strict have taken to smoking tobacco, although this is not in keeping with the tenets of their faith. To the designation 'Fire-worshipers,' which is so often applied to them, they strongly object, for their religion teaches the presence of Ormazd behind the fire, which stands merely as one of the emblems of his power. As in the days of the Avesta, they still wear the sacred shirt and girdle (now called *sūdrah* and *kusti*), and their priestly class are conspicuous for their white flowing robes.

Some of the present Parsi observances connected with birth and marriage may show slight traces of influence from the Hindus, but the Parsi rites connected with death have remained most individual and striking. As is well known, they expose the bodies of their dead on *Dakhmas*, or Towers of Silence, to be devoured by vultures. In this they adhere strictly to the precepts of the Avesta, although through force of circumstances, or otherwise, they are occasionally obliged to forego this manner of disposing of the dead. As a community, their moral status is ranked very high. In matters of education, especially female education, they are very advanced for Orientals. In all that relates to progress and civilization they are inclined largely to follow European examples. There is a growing tendency among them to spread a knowledge of their ancient sacred literature, and numerous editions or reprints of Avesta and Pahlavi texts and translations are yearly published by them. For acts of charity, benevolence, and generosity they are conspicuous. On the Parsis of Persia, see GHEBERS.

Consult: Karaka, *History of the Parsis* (London, 1884); Haug and West, *Essays on the Parsis* (3d ed., ib., 1884); Modi, "The Religious System of the Parsis," in *The World's Parliament of Religions*, vol. ii. (Chicago, 1893); Bharucha, *Zoroastrian Religion and Customs* (Bombay, 1893); Seervai and Patel, *Gujarāt Pārsis from Their Earliest Settlement to the Present Time* (ib., 1898); Menant, *Les Parsis, Histoire des communautés Zoroastriennes de l'Inde* (Paris, 1898).

PARSLEY (dialectic *parsil*, from OF. *persil*, *pierre essil*, Fr. *persil*, It. *petrosello*, *petroselino*, parsley, from Lat. *petroselinum*, from Gk. *πετροσέλινον*, rock-parsley, from *πέτρος*, *petros*, rock + *σέλινον*, *selinon*, sort of parsley), *Carum*. Annual or biennial smooth branching, tripinnate-leaved herbs of the natural order Umbelliferæ. Common parsley (*Carum Petroselinum*), a native of the south of Europe, is grown from seed sown in good garden soil, and is used for flavoring soups, garnishing meats, etc. Varieties with curled leaflets are generally preferred to those with plain leaflets. Hamburg parsley is a variety with large white carrot-like roots which are used in much the same way as the carrot or parsnip.

PARSLEY FAMILY. A popular name for the natural order Umbelliferæ (q.v.).

PARSLEY PIERT. A rosaceous plant. See LADY'S-MANTLE.

PARSNIP (ME. *parsenip*, *pasnepe*, from OF. *pastenaque*, *pastenade*, Fr. *pastenade*, *panais*, Sp., Port., It. *pastinaca*, from Lat. *pastinaca*, parsnip, from *pastinum*, sort of two-tined dibble), *Peucedanum*. A genus of annual, biennial, and perennial herbs of the natural order Umbelliferæ, with carrot-like fleshy roots and pinnate leaves. The common parsnip (*Peucedanum sativum*), a native of Europe and Northern Asia, is a biennial, with angular-furrowed stems two to three feet high, ovate leaflets, white roots, which are aromatic, mucilaginous, sweet, but slightly acrid. Cultivation has greatly modified the qualities of the roots, rendering them much more bland, and greatly increasing their size and fleshiness, thus improving their edible qualities. The parsnip delights in a very open rich soil, but will succeed in clayey soils far too stiff for the carrot. The mode of cultivation of the parsnip scarcely differs from that of the carrot. The parsnip is used chiefly in winter, whether for the table or for feeding cattle, for which it is highly valued, especially in Europe. It is improved rather than injured by frost; but is apt to become rusty if allowed to remain too long in the ground, and to become acrid after it has begun to grow again in the spring. Another species, the cut-leaved parsnip or sekakul (*Pastinaca Sekakul*), or Malabaila pumila of some botanists, with pinnatifid cut leaflets, a native of India, Syria, and Egypt, cultivated in the Levant, is very similar in its uses to the common parsnip. See Plate of ONIONS, OYSTER PLANT, ETC.

PARSON (OF. *persone*, Fr. *personne*, from ML. *persona*, person, curate, parson, Lat. *persona*, person, actor's mask). Strictly, one who

has full possession of all the rights of [illegible] chial church, as the representative or impersonator of the Church, which is an invisible body. The term is colloquially applied in a loose sense to any clergyman.

PARSON-BIRD, or TUI. A small, noisy forest-dwelling bird of New Zealand (*Prosthemadera Novæ-Zealandiæ*, of the family Meliphagidæ). Its plumage is black, excepting two small outgrowths of white feathers, one on each side of the throat, which suggest the 'bands' of a

THE PARSON BIRD.

clergyman in the pulpit robes of the Church of England. It "utters a wild song, laughs, coughs, sneezes, and mimics generally." Consult Buller, *Birds of New Zealand* (London, 2d ed., 1888). See Plate of CREEPERS.

PAR'SONS. A city in Labette County, Kan., 137 miles south by west of Kansas City, on the Missouri, Kansas and Texas and the Saint Louis and San Francisco railroads (Map: Kansas, G 4). One of the State insane hospitals has been located here, and five of the buildings are in process of erection. Among other prominent structures are the high school, the Missouri, Kansas and Texas railroad depot, the Catholic Church, Rasbach Hotel, the business college, the Masonic building, and the railroad Y. M. C. A. There are two fine parks—Forrest and Glenwood. The Missouri, Kansas and Texas maintains here car and machine shops, and its general offices for the State. The industrial establishments include also flouring and feed mills, grain elevators, a creamery, foundry, handle factory, chicken feed factories, etc. Natural gas is generally used for fuel and lighting. Founded and incorporated as a third-class city in 1871, Parsons became a city of the second class in 1873. The government is administered by a Mayor, elected every two years, and a council. Population, in 1890, 6736; in 1900, 7682.

PARSONS, ALBERT ROSS (1847—). An American musician and archæologist, born at Sandusky, Ohio. He studied music with several American teachers; with Moscheles, Reinecke, Papperitz, and Richeter in Leipzig, 1867-69, and with Tausig, Weitzmann, and Kullak in Berlin, 1870-71. He became a very successful teacher and composer, and his songs are especially popular. "Night Has a Thousand Eyes," "Break, Break," and "Three Fishers" have been extensively sung throughout America and Europe. During his career as a teacher he originated the 'synthetic method' for pianoforte; he translated Wagner's *Beethoven* (1870); wrote *Parsifal: New Light from the Great Pyramid* (1893), a study in cosmic religion and prehistoric Christianity; and edited Kullak's *Complete Works of Chopin*. He held several important New York church organist-ships. In 1890 [illegible] president of the Music Teachers' National Association, and subsequently acted as [illegible] American College of Musicians of the [illegible] of the State of New York, and [illegible] the Metropolitan College of Music.

PARSONS, ALFRED WILLIAM (1847—). An English painter, born at Beckington. He studied at Heatherley's and at the South Kensington schools, and afterwards worked [illegible] from nature. He first exhibited at the Royal Academy in 1871. His best known pictures [illegible] of English scenery. They [illegible] drawn and brilliant in color. His [illegible] "When Nature Painted All Things Gay" (1887), bought by the Chantrey Bequest; "A May Morning;" "The First Frost;" and "The Vale [illegible] by the Links." He received a gold medal for water color and a silver medal for oil painting at Paris in 1889, two medals at Chicago in 1893, and a second-class gold medal at Munich in 1893. He also worked in black and white, and his illustrations include those done with E. A. Abbey for *Old Songs* and *A Quiet Life*; *The Warwickshire Avon*; *Wordsworth's Sonnets*; and *The Danube from the Black Forest to the Black Sea* (1891).

PARSONS, CHARLES (1821—). An American painter and illustrator, born in Manchester, England. He studied at the National Academy of Design in New York City, and [illegible] worked in lithography. From 1861 until 1889 he had charge of the art department of Harper and Brothers, New York City. His work includes landscapes and marines, which are mostly in water color, and, like his illustrations, are notable for their picturesque qualities. He was elected an associate of the National Academy of Design in 1860, and a member of the American Water Color Society.

PARSONS, FRANK (1854—). An American educator, born at Mount Holly, N. J. He graduated at Cornell in 1873, and in 1897 became professor of history and political science at the Kansas Agricultural College. In 1900 he was appointed professor of political science and economics at Ruskin College, Missouri, and from 1892, lecturer on law at Boston University. His publications include [illegible] (1894); *The [illegible]* (1898); [illegible] (1899); and [illegible] (1900).

PARSONS, or **PERSONS,** ROBERT (1546-1610). An English Jesuit and controversialist, born at Nether Stowey, Somersetshire, June 24, 1546. He is said to have been the son of a blacksmith. Educated at Saint Mary's Hall and Balliol College, Oxford, he was elected fellow of Balliol (1568) and subsequently dean (1574). [illegible] Dr. [illegible] that the story [illegible] was slander; but in 1574 [illegible] Oxford for [illegible] into the Society of Jesus (1575), and [illegible] (1578). In 1580 he was sent with [illegible] to England to help the [illegible] clergy. He [illegible] converts among [illegible] bility. Having [illegible] a printing press [illegible] was moved from place to place, he [illegible] in connection with it many [illegible] among which were *A Brief Discourse* [illegible] *Certain Reasons why Catholics Refuse* [illegible]

Church (1580), and Campion's more famous *Decem Rationes* (1581). In 1581 Campion was caught and executed, but Parsons escaped to Normandy. His great energies were now devoted to the restoration of the Catholic Church in England. Going to Spain, he urged on the attempted invasion of Philip II., which resulted in the disaster of 1588. He also labored at the Catholic courts of Europe to save Mary, Queen of Scots. A skillful organizer, he founded schools for English Roman Catholics at Eu in Normandy (1584), at Saint Omer (1592), and at several places in Spain. Appointed rector of the English College in Rome in 1597, he exerted immense influence. Parsons died in Rome, April 15, 1610. He wrote a clear and vigorous English style, which was commended by Swift and Gibbon. Consult Foley, *Records of the English Province of the Society of Jesus* (5 vols., London, 1877-79).

PARSONS, Samuel Holden (1737-89). An American soldier and judge, born at Lyme, Conn. He graduated at Harvard in 1756, studied law at Lyme, Conn., with Governor Matthew Griswold, his uncle; began practice in 1759; and was, for eighteen years, a member of the Connecticut Assembly. In 1774 he removed to New London and became a member of the Connecticut Committee of Correspondence. At the outbreak of the Revolutionary War he took command of the Sixth Connecticut regiment, was present at the siege of Boston and at the battle of Long Island, and planned the attack on Ticonderoga, being promoted for his services to the rank of brigadier-general in August, 1776, and of major-general in 1780. At the close of the war he practiced law at Middletown, Conn. In 1785 he was a member of a commission appointed to treat with the Miami Indians; in 1788 he sat in the convention which ratified, for Connecticut, the Federal Constitution; and in 1789 he became on Washington's appointment, the first judge of the Northwest Territory. He settled near Marietta, Ohio, and soon afterwards, on behalf of Connecticut, bought from the Indians about Lake Erie their claim to the 'Western Reserve.' He was drowned in the Big Beaver River while returning from this expedition. Within recent years letters have been discovered which seem to convict Parsons of treason in supplying the British with information during the Revolutionary War, but the evidence is not conclusive. Parsons published a paper on the "Antiquities of the Western States," in vol. ii. of the *Transactions of the American Academy*. Consult Loring, *A Vindication of General Parsons* (1888).

PARSONS, Theophilus (1750-1813). An eminent American jurist. He was born at Byfield, Mass., February 24, 1750, and graduated at Harvard in 1769. From 1770 to 1773 he taught school at Falmouth, now Portland, Maine, at the same time studying law, and was admitted to the bar in 1774. He began the practice of his profession at Falmouth, which was laid waste by a British squadron in October, 1775; and Parsons, whose prospects for professional success at Falmouth were ruined by this disaster, returned soon afterwards to Byfield, his native town. There, for some years, he studied under Judge Edmund Trowbridge, of the Massachusetts Superior Court. Parsons finally removed to Newburyport, where he soon acquired an extensive practice. In 1778 he was active in the discussion of the new Constitution of Massachusetts, then recently framed by the Legislature. Parsons was strongly opposed to the adoption of that instrument; he was a member of the 'Essex Junto,' which comprised a large number of the citizens hostile to the new Constitution; and the pamphlet called *The Essex Result*, which had a great influence in bringing about the defeat of the Constitution, is attributed to him. In 1779 he sat in the convention which drew up the Constitution which with some changes still exists as the fundamental law of Massachusetts. In 1788 he was a member of the State convention called to ratify the Federal Constitution, which he warmly supported, and the so-called *Proposition* in favor of its adoption, though offered by John Hancock, was drawn up by Parsons. He settled in Boston in 1800. From 1806 until his death he was Chief Justice of the State Supreme Court. His judicial opinions have not been fully reported, but those preserved in the early Massachusetts reports and in his *Commentaries on the Law of the United States* (1836) show great ability and learning, especially in the department of real property and marine insurance. He died at Boston, October 30, 1813. A memoir (Boston, 1859) was prepared by his son, Theophilus. Consult also a sketch by Knapp (Boston, 1821).

PARSONS, Theophilus (1797-1882). An American jurist and legal author; born at Newburyport, Mass., in 1797. He graduated at Harvard in 1815, was admitted to the bar, and began to practice in Taunton. Soon afterwards he removed to Boston, where he became the founder and editor of the *United States Literary Gazette*. He was also a frequent contributor to the *North American Review*. In 1847 he was appointed Dane professor of law in the law school of Harvard University, an office which he filled with distinction for a quarter of a century. His works are characterized by accuracy and practical usefulness to the profession, rather than by profundity of knowledge or great legal acumen. They were consequently very successful in winning the favor of the profession and have, through successive revisions, retained their position as useful legal hand-books. His best known works are: *Treatise on the Law of Contracts* (1853; 8th ed. 1893); *Elements of Mercantile Law* (1856); *Law of Partnership* (1867; 4th ed. 1893); *Marine Insurance Average* (1868). He was a Swedenborgian, and he produced a number of works maintaining the doctrines of the New Jerusalem Church. The most important are *Essays*, in three series; *Deus Homo* (1867); and *The Infinite and the Finite* (1872).

PARSONS, Thomas William (1819-92). An American poet and translator of Dante, born and educated in Boston. In 1836 he went to Italy, where his studies in the literature of that country resulted in his well-known translation of the first ten cantos of Dante's *Inferno* (1843). This part of the *Divina Commedia* he completed in 1867. He translated much of the *Purgatorio* and a few fragments of the *Paradiso*, but he never completed the work. He later took up dentistry as a profession, and practiced in Boston and in London. The last twenty years of his life were

spent in or near Boston. Parsons owes his fame almost wholly to his interpretation of Dante. Most of this translation is in rhymed couplets. It may be said without exaggeration that Parsons has come nearer to Dante than any other translator in English, nor is his best work rivaled by foreign translators. Aside from his Dante translations, his work includes: *Ghetto di Roma* (1854); *The Magnolia, and Other Poems* (1867); *The Old House at Sudbury* (1870); and *The Shadow of the Obelisk, and Other Poems* (1872). His best-known poem, *On a Bust of Dante* (first published in the Boston *Advertiser and Patriot* in 1841), like most of his verse is characterized by depth of feeling and dignity and delicacy of expression. He is the Poet of Longfellow's *Tales of a Wayside Inn*. Parsons died in Scituate, Mass., September 3, 1892. His poems appeared in a definite edition in 1893.

PARSONS' CAUSE. The name of a celebrated case decided by the court of Hanover County, Va., in December, 1759; remembered chiefly because of a speech made before the court by Patrick Henry (q.v.). From the earliest history of the colony the salaries of the clergy in Virginia had been paid in the form of tobacco, long the colony's chief staple. Owing to fluctuations in the value of tobacco, the actual amount thus paid had varied widely, the clergy receiving the advantage of a rise in price and correspondingly suffering the disadvantages of a fall. In 1748 the Legislature of Virginia passed an act fixing the salary of the clergy at 16,000 pounds of tobacco, and George II. formally approved the act. In 1758, when the price of tobacco was unusually high, the Legislature passed an act, to be in force for twelve months, similar to a previous act of 1755, which had lapsed, and which had provided that the salary of the clergy might be paid in paper currency instead of tobacco, at the rate of two cents per pound, a price below the market value of tobacco at that time. Upon the protest of the clergy the act of 1758 was disallowed by the King, and various clergymen forthwith brought suit against their vestries for the salaries legally due them for the year 1758. One such suit was brought by the Rev. James Maury before the court of Hanover County, and Patrick Henry, then a young, almost unknown lawyer, was engaged by the defendants as counsel. The Court decided against the validity of the act of 1758, such act having been disallowed by the Crown, but the jury, influenced by an impassioned speech by Henry, returned a verdict of only one penny damages. The speech made by Henry was the first in which he attracted general attention, and was sufficiently radical to be considered incendiary and treasonable by the conservative element in the colony. According to the report of Maury, Henry argued that since the act of 1758 was an act of general utility, it could not be annulled by the King, and asserted that "a king by disallowing acts of this salutary nature, from being the father of his people, degenerates into a tyrant, and forfeits all rights to his subjects' obedience." Consult Tyler, *Patrick Henry* (Boston, 1887), in The American Statesmen Series.

PARSON'S TALE, THE. The last of Chaucer's *Canterbury Tales*, and, like "Melibœus," written in prose. It is a discourse on penitence, from the Vulgate text of Jeremiah, vi. 16, and is mainly an adaptation from Frère Lorens, *La somme des vices et des vertus*, published in 1279, through the English translation entitled *The Ancrene of Iwyt* (remorse of conscience). It contains many quotations from the Latin Fathers, and was probably once a separate treatise written before 1380. It has been inferred from the closing Retractation that Chaucer became a Wicliffite, but leading authorities consider this view far-fetched.

PAR'SONSTOWN, or BIRR. A town in King's County, Ireland, on the Brosna, 43 miles northeast of Limerick (Map: Ireland, D 3). It is an important corn market, a considerable centre of inland commerce, a military station, and the seat of a union workhouse, and is one of the handsomest and best built towns in Ireland. It has several fine churches and chapels, a nunnery, a statue of the Duke of Cumberland, a bronze statue of the Earl of Rosse, a town hall, a library, literary institute, a model school, and other educational institutions. The principal attractions are the castle, the observatory, containing a great telescope, 52 feet long, and the laboratory of the late Earl of Rosse (q.v.), still maintained in active use by the present Earl. Birr had its origin at an early period in a monastery founded by Saint Brendan, and was the scene of many important events, both in the Irish and in the post-invasion periods. Population, in 1901, 4438.

PART (OF., Fr. *part*, from Lat. *pars*, part; connected with Lat. *parare*, to prepare, Gk. ἔπορον, *eporon*, I prepared). In music, when a piece of music consists of several series of sounds performed simultaneously, each series is called a part. In a composition a distinction is made between *real parts* and *auxiliary parts*. *Real parts* are those that progress through an entire composition as so many individual voices. A vocal fugue may be written for three, four, or five voices. It has, therefore, three, four, or five *real parts*, even if one or more voices rest for a number of bars. *Auxiliary parts* are in reality but detached tones serving to mark a strong accent by doubling some or all tones contained in the *real parts*. It is evident that in vocal music no *auxiliary parts* can occur. But in writing for keyed instruments or full orchestra composers make frequent use of such auxiliary tones. In a composition for pianoforte, for example, let us say four *real parts* are used. In certain places the composer desires more sonority and there he writes six or even more tones to be struck simultaneously. Any number above *four* tones constitutes the *auxiliary part*, for such voices are added only occasionally. Care must be taken not to introduce *auxiliary parts* too closely together, as the ear is apt to conceive them as *real parts*, and consequently to demand adherence to the strict rules of progression exacted in the real parts. A splendid example of the use of *auxiliary parts* is furnished by the opening bars of Beethoven's A Major Symphony, where the strings are used in *auxiliary parts* to give a strong accent to the first beat of the 1, 3, 5, and 7 measures, while the *real parts* are given to the wood-wind.

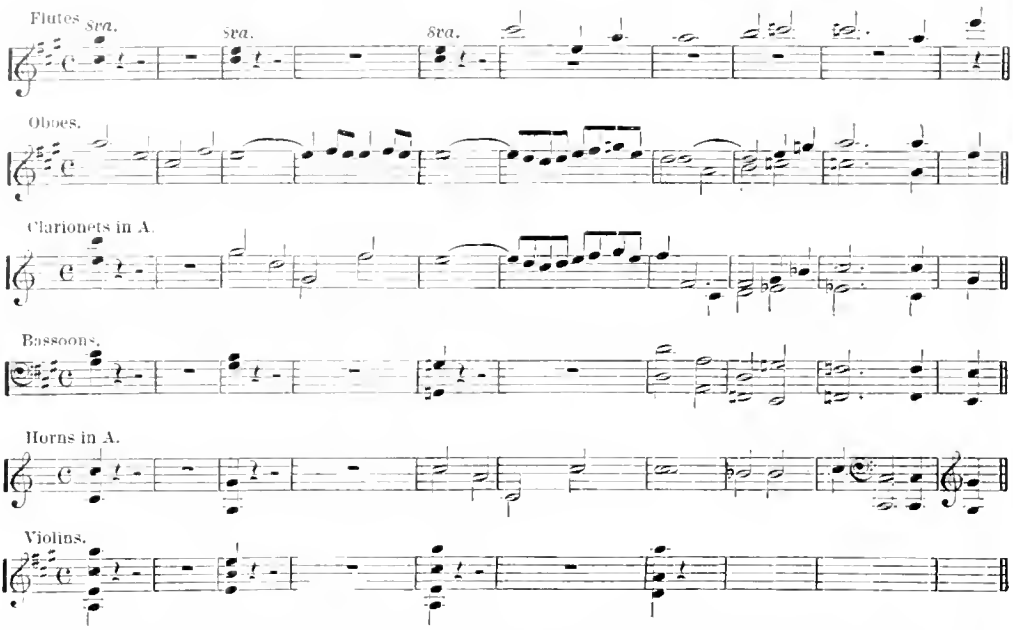
In this example the oboes have a *real part* throughout; the clarinets enter with a *real part* in the third bar; the flutes in the sixth; the

horns in the fifth; the bassoons in the seventh bar. The violins throughout have only *additional* parts or notes. The detached notes of the other instruments before their participation in the *real* parts are also considered additional parts.

four singers could sit opposite, facing each other in pairs.

Soprano	Tenor
Alto	Bass

This was a decided improvement. Such part-



PARTANNA, pär-tän'nä. A town in the Province of Trapani, Sicily, 38 miles southwest of Palermo (Map: Italy, G 10). It is on a hill which commands an extensive view, and is interesting because of the remains of Greek works of art found here. Ruins of several Saracenic castles are still to be seen. There is a trade in grain, wine, and oil. Population (commune), in 1881, 13,144; in 1901, 14,059.

PARTANT POUR LA SYRIE, pär'tän' poor lä sē'rē' (Fr., departing for Syria). A ballad by Count de Laborde (1809). A young warrior, Dunois, by his bravery in Syria, wins a battle and gains the daughter of his lord. Queen Hortense composed music for the ballad, which became extremely popular long after her death, during the Second Empire.

PART-BOOK. In music, a book containing an entire part of a composition for a single performer. Before the seventeenth century scores were practically unknown. The individual voices or parts of a polyphonic composition were printed in separate books, just as are the separate parts of an orchestral composition used by the members of a modern orchestra. In order to simplify the interpretation of the music, part-books were also so arranged that all the parts were printed in a single book, but not in score. The soprano and alto appeared on the left-hand page, while the tenor and bass were printed on the right-hand page.

Soprano	Tenor
Alto	Bass

The music was so arranged that all parts turned at the same time. Jacques Moderne in 1539 printed a part-book in such a manner that the books containing all the parts were printed in very large type for the convenience of the performers; whereas the single part-books were generally printed in very small type.

PARTHE'NIUS (Lat., from Gk. *Παρθένιος*). A Greek grammarian and poet, who lived at Rome in the first century B.C. He taught Vergil Greek, and was an intimate friend of the elegiac poet Cornelius Gallus, to whom he dedicated his *Erotic Experiences* (*Περὶ ἐρωτικῶν παθημάτων*), the only work of his which has survived. This was a collection of thirty-six brief stories of unhappy lovers, compiled from ancient poets, and was intended to furnish Gallus with themes for his epic and elegiac poems. The work contains interesting quotations from the Alexandrine poets, and is valued as a precursor of the Greek novels. It has been edited by Westermann in his *Μυθογράφοι* (Brunswick, 1843), and by Hirschig, in the *Scriptores Erotici Graeci* (Paris, 1856). According to the Ambrosian manuscript of Vergil, the latter's poem *Moretum* was an imitation of Parthenius's Greek work of the same title.

PARTHENOGEN'ESIS (Neo-Lat., from Gk. *παρθένος, parthenos*, virgin + *γένεσις, genesis*, production, from *γίγνεσθαι, gignesthai*, to become). The essential phenomenon of sexual generation is the union of a male with a female cell. Within the past half century, however, comparatively numerous cases have been discovered where unfertilized eggs have developed into an adult organism. Such cases in certain animals are known to be in a degree regular, normal methods, and the phenomenon is called agamous, virgin reproduction, or 'parthenogenesis,' the name proposed by R. Owen. The most

typical case of parthenogenesis is that of the aphis or plant-louse. The species is represented in the aphides by eggs alone. (See Hop-Insects.) In the spring females alone hatch, and no males appear until at the close of summer. Bonnet discovered that a virgin aphis may become the parent of millions of aphids, like itself, there being nine generations through the summer. Duval obtained eleven generations in seven months, while Kyber even observed that a colony of *Aphis dianthi*, which had been brought into a constantly heated room, continued to propagate for four years in this manner, without the intervention of males. At the approach of cold weather males appear; they mate with the females, the latter laying eggs. There are thus two sets of females, the parthenogenetic and the normal oviparous forms. The queen bee also lays eggs in the drone or male cells of the honeycomb, which are unfertilized and give rise to males.

Cases of parthenogenesis are known to occur rarely in other Hemiptera than aphids, namely in bark-lice, and in the silk-worm, and 25 or more other species of moths. Among Hymenoptera, besides the honey bee and some wild bees (as Halictus), the currant worm (*Nematus ventricosus*) and twelve other species of saw-flies have been known to lay parthenogenetic eggs; also many gall-flies; in several species of ants, and in wasps (Polistes), the parthenogenetic eggs produce males. Among beetles, *Gastrophysa raphani* and a species of caddis-fly are at times parthenogenous; also certain mites and other insects, and in the crustaceans Apus, Artemia, and Limnadia.

It was formerly supposed that these parthenogenetic eggs were different from normal eggs, and they were called 'pseudova' by Huxley, but this view is untenable, since these 'pseudova' arise just like ordinary eggs and develop like them, as they undergo cleavage of the yolk and form germ-layers. R. Hertwig claims that parthenogenesis is "a sexual reproduction in which a degeneration of fertilization has taken place, and the facts of parthenogenesis show that under change of conditions the normal mode of sexual reproduction (amphigony) may be modified for the benefit of the species."

Pædogenesis. The larva or maggot of a certain gall-gnat fly is known to produce young which is developed within the body of the larva from a 'germ-ball' essentially agreeing with an ovary in appearance. The asexual larvæ begin life as egg-like bodies developed from the germ-ball, just as eggs are developed in the little tubes of which the ovary is an aggregation. Both Wagner and Leuckart conclude that the processes of embryonic growth agree in all essential points with the ordinary phenomena of development in a

PARTHENOGENESIS.

Larva of a gall-gnat (*Cecidomyidæ*) with pædogenetic daughter-larvæ.

fecundated egg, and exactly as in the case of Aphis parthenogenesis. The only difference consists in the germ chambers of the cecidomyid larvæ separating from the germ-stock, and moving freely about in the cavity of the body, while in the aphids, in which there is no metamorphosis, the germ-stock is a true ovary. It thus appears that the true ovary or germ mass of the parent maggot becomes prematurely developed, and the growth of young is thus greatly accelerated. The maggots live under the bark of the apple tree in Germany, Denmark, and Russia, the phenomena occurring in two species of Cecidomyiidæ (*Miastor metroloas* and *Oligarces paradoxus*). Here also belongs the case of larval reproduction in Amblystoma.

Oreysalogenesis. This term is applied by Packard to a form of pædogenesis which occurs in the chrysalis of a gnat of the genus Chironomus. In 1869 Grimm discovered the pupa of a species of this gnat laying eggs. In autumn other pupæ changed to flies without laying eggs, while the fly was observed to deposit a larger number of eggs than the spring pupa. It is thus seen to be a seasonal phenomenon, dependent on the temperature. Grimm also found that on removing from the perfectly developed insect, before it has left the pupa case, the eggs which otherwise would have been fertilized, and nurturing them in water, the development of the larvæ took place in them also, but lasted a little longer (about six days).

Metagenesis. This term was proposed by Owen in 1848 in his *Parthenogenesis*, and afterwards more fully in his *Lectures on the Comparative Anatomy and Physiology of the Invertebrate Animals* (London, 1858). His examples are the alternation of generations of the distomes, the hydroids, medusæ, and even the metamorphoses of the echinoderms, the gemmation of Nais and other annelids, as well as the metamorphoses of the fish-lice (Œthera, etc.), which he says "is a slightly modified parthenogenesis;" again, he regards the phases they pass through as "much more those of a metagenesis than a metamorphosis." (See Alternation of Generations.) In his paper on the agamic reproduction of Aphis, Huxley employs the term 'agamogenesis,' which he says occurs "when the produced 'zoöid' is capable of development into an independent organism without the influence of an act of conjugation with another zoöid. The producing zoöid may be devoid of sexual organs, as in the Salpæ, many Hydrozoa, and many Trematoda," in fact in the great majority of cases of agamogenesis; and to this kind of alternation of generations he applies Owen's term 'metagenesis,' restricting the term 'parthenogenesis' to cases where the parent ('protozoöid') possesses sexual organs (ovaries), and its buds have all the histological characters of ova. Metagenesis is defined by R. Hertwig as "alternation of generations in the narrower sense." It is the alternation of at least two generations, of which one reproduces only asexually, by division or budding, the other either exclusively, or at least to a great extent, sexually. The first generation is called the 'nurse;' the second, the 'sexual animal.' The best example is furnished by the mode of reproduction of Hydromedusæ. (See Hydrozoa.)

Heterogony. This differs from metagenesis by the fact that the asexual generation is replaced by parthenogenesis. For example, in certain Crustacea (Daphnidæ) only females occur in the summer time, which increase by unfertilized eggs. Then males appear for a short time, which fertilize the winter eggs which

now produced, from which again parthenogenetic generations arise (R. Hertwig).

Causes of Asexual Reproduction. Taking all these cases together, asexual reproduction or parthenogenesis in general is seen to be due to budding or cell-division in the egg. The asexual aphids bud out from the ovary. It was for a long time held, says Hertwig, that the cells from which the cercariæ arose were not eggs, but 'internal buds,' 'germinal granules.' The fact seems to be that normal reproduction with growth and parthenogenesis are but extremes of a single series. The asexual mode of reproduction is most probably due to temperature and other changes in the conditions of life, as change of food, and, in parasitic animals, change of host (Packard). The phenomenon takes place in the summer, and in almost every case ceases at the approach of cold weather.

The case of dimorphism of a thread-worm has been incorrectly regarded as heterogony, but it is simply due to changes of temperature. Thus in low temperature filaria-forms directly arise from the young of *Rhabdonema* (*Anguillula*) *intestinalis;* but in the summer heat indirectly forms a Rhabditis form. Wasman was able, during three summers, to induce parthenogenesis in the workers of *Formica sanguinea* and their slaves (*Formica pisca*) by artificially warming the nests. Abundant food favors parthenogenesis, though in Phylloxera the stoppage of the food supply induces parthenogenesis. See *Effects of Changes of Temperature*, under Evolution.

Artificial Parthenogenesis. Experiments by Herbst, R. Hertwig, T. H. Morgan, and especially by Loeb, show that the unfertilized eggs of the sea-urchin may be so stimulated by chemical solutions as to undergo the earlier phases of development. Herbst experimented with potassium chloride and lithium chloride, but found that while the larvæ developed, they were monstrous and finally perished. Hertwig and also Morgan showed that if unfertilized eggs be treated by weak solutions of sodium chloride, magnesium chloride, or strychnine, they exhibit some of the preparatory changes of yolk-division, and might actually divide, though without producing an embryo. Loeb finally succeeded in rearing large numbers of perfect larvæ from eggs which, without fertilization, are first treated with a weak solution of magnesium chloride, and then transferred to normal sea-water. It thus appears that experiments carried out under rigidly controlled conditions show that the egg, without union with a sperm-cell, is capable of complete development. In commenting on these discoveries E. B. Wilson (*International Monthly*, July, 1900) remarks that even in normal fertilization we must regard the stimulus to development as being given by a specific substance or substances carried by the spermatozoön. The experiments lead us to suppose that the chemical salts used "are individually poisonous to the egg, but are normally so balanced as to neutralize one another's injurious effects and maintain the equilibrium of the egg. If this armed neutrality be disturbed, the egg responds, undergoing degenerative changes, and dying if the change be too violent, passing through an abnormal development and giving rise to monstrous embryos if the new conditions be less unfavorable, but under appropriate stimulus being, as it were, released from bondage, and rendered free to run its normal course of development."

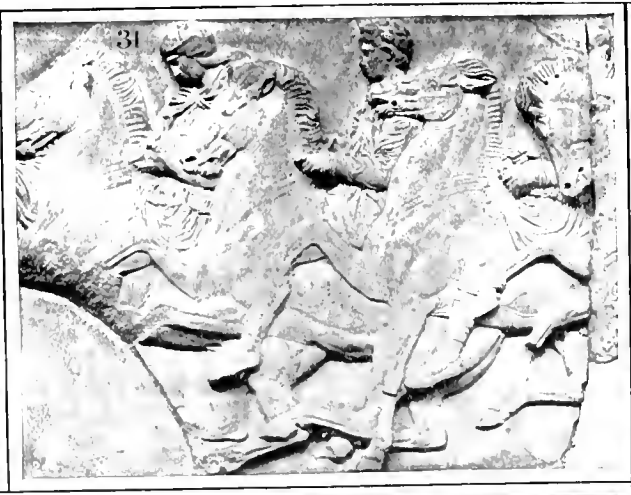
In Plants. Among plants an embryo is frequently formed by a budding outgrowth from tissues outside of the egg, and to such a phenomenon the term parthenogenesis has often been wrongly applied. The general term covering all cases of the appearance of embryos without fertilization, when that process is ordinarily required, is apogamy (q.v.), parthenogenesis being that form of apogamy in which the embryo comes from an unfertilized egg. In tracing the origin of sex among plants, it seems evident that the sexual cells (gametes) are derived from such cells as the sexless swimming spores (zoöspores) of the algæ. These spores have the power of producing new plants, so that when sexual cells, without pairing in the process of fertilization, independently produce new plants, it is simply the resumption of an ancestral power. The most primitive sexual cells show no distinction of sex, and in such cases parthenogenesis is very common. In the higher development of sexuality, however, the pairing gametes are very unlike, becoming the sperm and egg, and in such cases parthenogenesis is more rare, and occurs only in connection with the egg.

By the process of fertilization the egg is induced to divide, and this is the beginning of an embryo. Certain eggs may be artificially induced to divide by other means than fertilization, and to produce embryos. Just what the stimulus is which induces the egg to divide is yet undetermined, but it seems probable that natural parthenogenesis results from the same general conditions that obtain in artificial parthenogenesis.

As might be expected, parthenogenesis in plants is most common among the algæ and fungi, there being well-known cases, as the water molds (Saprolegnia), in which the eggs are never fertilized, and parthenogenesis is the normal method of embryo formation. Among the higher groups of plants, however, it is the exception, and among seed-plants (spermatophytes) probably the very rare exception. But three cases of real parthenogenesis among seed-plants have been determined, though doubtless there are others. These are in certain species of Antennaria (Compositæ), of Alchemilla (Rosaceæ), and of Thalictrum (Ranunculaceæ).

Bibliography. Saks, "Zur Entwicklungsgeschichte der Mollusken und Zoöphyten," in Wiegmann's *Archiv für Naturgeschichte*, i. (Berlin, 1837); Steenstrup, "On the Alternation of Generations," in *Transactions of the Royal Society* (London, 1845); Owen, *On Parthenogenesis* (ib., 1849); id., *Lectures on the Comparative Anatomy and Physiology of Invertebrate Animals* (2d ed., 1855); Huxley, "On the Agamic Reproduction and Morphology of Aphis," in *Transactions of the Linnean Society of London*, vol. xxii. (London, 1858); Siebold, "On a True Parthenogenesis in Moths and Bees," in *Transactions of the Royal Society* (ib., 1857); id., *Beiträge zur Parthenogenesis der Arthropoden* (Leipzig, 1871); Leuckart, "Sur l'arrhénotokie et la parthénogénèse des abeilles et des autres hyménoptères qui vivent en société," in *Bulletin de l'Académie des Sciences de Bruxelles*, series ii., vol. iii. (Brussels, 1857); id., *Zur Kenntniss des Generationswechsels und der Parthenogenesis*

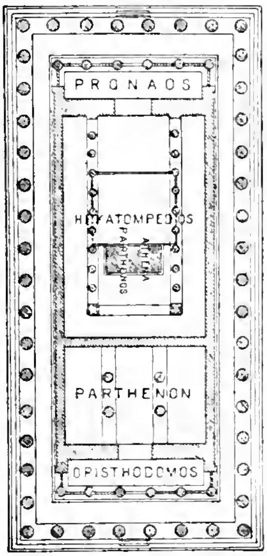
PARTHENON



1. METOPE — Centaur and Lapith.
2. FRIEZE — Athenian Cavalry.
3. EAST PEDIMENT — The Three Fates (so called).
4. THE VARVAKEION STATUETTE, a copy of the Athena Parthenos.

bei den Insekten (Frankfort, 1858); Von Baer, *Ueber Prof. Nic. Wagners Entdeckung von Larven, die sich fortpflanzen, Herrn Ganins verwandte und ergänzende Beobachtungen und über die Pädogenesis überhaupt* (Saint Petersburg, 1865); Taschenberg, *Historische Entwickelung der Lehre von der Parthenogenesis* (Halle, 1893). This last named work contains a full bibliography up to and including 1892.

PAR'THENON (Lat., from Gk. Παρθενών, from παρθένος, *parthenos*, virgin). A celebrated temple of the virgin goddess Athena, on the Acropolis of Athens. The highest triumph of Greek Doric architecture, it was the work of the architect Ictinus, while the sculptures are generally believed to have been designed by Phidias. The building was a Doric octostyle peripteros with 17 columns on the long sides. It was 100 by 225 Attic feet (about 101 by 228 English feet), and from the top of the stylobate to the gable about 59 feet. Back of the outer row of 8 columns, at either end of the temple, are 6 columns, forming the fronts of the *pronaos* and *opisthodomos*. The main hall of the temple, called the *hekatompedos*, was 100 Attic feet in length, and contained the great gold and ivory statue of Athena by Phidias. Back of this was another room, entered from the opisthodomos only, and called the *parthenon*. In the building the most delicate refinements were introduced in order to correct optical distortions. The lines of the stylobate, cornice, and columns were delicately curved, though with such nicety that much can be detected only by the most careful measurement. That these refinements were carefully calculated from the start is shown by the cutting of the rock on which the crepidoma rests to allow of the proper curvature in the lines of the stylobate. The whole building was of carefully selected white Pentelic marble, with the exception of the tiles of the roof, for which Parian marble was employed. (See Colored Plate under ARCHITECTURE.) Begun about B.C. 447, the temple was sufficiently completed to permit the installation of the statue in B.C. 438. It continued in use till the end of the fifth or possibly the sixth century of our era, when it was transformed into a Christian church, dedicated at first to Saint Sophia and later to the Virgin. After the capture of Athens by the Turks (A.D. 1458) it became a mosque, and a minaret was built in the southwest corner. It was, however, but little damaged, and in 1674 the sculptures were drawn by Jacques Carrey and other artists in the suite of the Marquis de Nointel. In 1687, during the siege of Athens by the Venetians, the Turks used it as a powder magazine, and on September 26th a Venetian bomb fell through the roof, causing an explosion which killed 300 persons, and completely destroyed the central portion of the buildings. Early in the nineteenth century Lord Elgin secured permission to remove the sculptures to London. (See ELGIN MARBLES.) Apart from its value in the history of architecture, the Parthenon is of the greatest importance for the history of Greek sculpture. The two pediments were filled with colossal sculptures in the round, those in the east representing the birth of Athena from the head of Zeus, and those in the west the contest of Athena and Poseidon over Attica. The ninety-two metopes, all of which were sculptured, represented the struggle between the gods and the giants on the east, and the Athenians and Amazons on the west. On the south was the battle between the Centaurs and Lapithæ, and on the north the capture of Troy and the victory over the Persians. But the great glory of the temple was the long frieze which ran entirely around the outer wall of the cella and over the columns at either end, wrought in low relief in the most perfect style of the noble art of the fifth century. It represented the great Panathenaic procession, in which all classes of Athenians assembled to do honor to the goddess. The effect of the sculptures and architecture was enhanced by the use of color and metal to bring out the details. The metopes show marked stylistic differences, both in design and execution, and cannot all be attributed to the mind of a single artist, nor can it be supposed that the other sculptures were the work of a single hand, though they seem to most critics to show the influence of one master mind. They are characterized by a severe simplicity, scorning anything that savors of sensationalism or prettiness, but full of life and vigor in the animation of the frieze, of calm dignity in the figures of the gods, and everywhere marked by harmony and beauty in the lines and almost perfect technical skill in the treatment of the material. (See PROPYLÆA and ATHENS.) In addition to the treatises on Greek sculpture cited under GREEK ART, consult: Michaelis, *Der Parthenon* (Leipzig, 1871), the standard work; Penrose, *Principles of Athenian Architecture* (2d ed., London, 1888); Magne, *Le Parthénon* (Paris, 1895); and the unfinished work of Laborde, *Le Parthénon* (Paris, 1848), containing Carrey's drawings.



PLAN OF PARTHENON.

PARTHENOPE, pär-thĕn'ō-pē (Lat., from Gk. Παρθενόπη). (1) The daughter of Stymphalus, beloved by Hercules. (2) A siren who drowned herself for love of Ulysses. She was cast up by the sea at Naples, which was named for her.

PAR'THENOPE'AN REPUBLIC (from *Parthenope*, the ancient name of the city of Naples). The name given to the State into which the Kingdom of Naples was transformed by the French Revolutionists, January 23, 1799. It only lasted until the following June, when the invaders [illegible] to retreat.

PAR'THIA (Lat., from Gk. Παρθία, *Parthia*, [illegible], *Parthuaioi*, Παρθοι, *Parthoi*, Parthians). An ancient country, which consisted of part of the territories of the old Persian Empire, lying to the southeast of the Caspian Sea. The original inhabitants were probably of Turanian stock, related to the great

tribes of Central Asia, whence have come the Huns, Mongols, Turks, and Magyars. The Parthians were distinguished by primitive simplicity of life and extreme bravery, though at the same time they were much given to bacchanalian and voluptuous pleasures. They neglected agriculture and commerce, devoting their whole time to predatory expeditions and warfare. They fought on horseback, and after a peculiar fashion. Being armed solely with bows and arrows, they were rendered defenseless after the first discharge, and, to gain time for adjusting a second arrow to the bow, turned their horses and retired, as if in full flight, but an enemy incautiously pursuing was immediately assailed by a second flight of arrows; a second pretended flight followed, and the conflict was thus carried on till the Parthians gained the victory or exhausted their quivers. They generally discharged their arrows backward, holding the bow behind the shoulder, a mode of attack more dangerous to a pursuing enemy than to one in order of battle. They were conquered by Cyrus in the sixth century before Christ, and their country was organized into a satrapy under Darius. Parthia was included in the conquests of Alexander the Great and after his death formed a part of the Seleucid Syrian kingdom, until about B.C. 250 the people revolted successfully under Arsaces, founder of the dynasty of the Arsacidæ (q.v.), who maintained a most tyrannical despotism. The capital of the Parthian monarchy was Hecatompylos ('the city of the hundred gates'). The dominion of Parthia rapidly extended to the Euphrates and the Indus, and it became a most powerful and flourishing empire; Seleucia, Ctesiphon—the capital of the Persian emperors of the Sassanidæ—and other celebrated cities date their rise from this period, and soon eclipsed, in size and splendor, the ancient Hecatompylos. In spite of repeated attacks on the part of the Romans, the Parthians maintained their independence (see CRASSUS, MARCUS); and though Trajan, in A.D. 115-117, seized certain portions of the country, the Romans were soon compelled to abandon them. In 165, however, the Romans took from Parthia considerable territory. The final struggle with Rome took place in 217, when a desperate drawn battle at Nisibis made both parties desirous of peace. The Parthian kingdom was then weakened by dissension, and in 226, during the reign of Artabanus IV., the last of the Arsacidæ, a revolt headed by Ardshir, son of Babegan, broke out in Persia, and the Parthian monarch, beaten in three engagements, lost his throne and life, the Persian dynasty of the Sassanidæ (q.v.) taking the place of the Arsacidæ. Some scions of the Parthian royal family continued for several centuries to rule over the mountainous district of Armenia, under the protection of the Romans, and made frequent descents upon Assyria and Babylonia; but their history is obscure and of little importance. Consult: Rawlinson, *The Sixth Great Oriental Monarchy* (London, 1873); id., *The Story of Parthia* (New York, 1889).

PARTICIPLE (Lat. *participium*, participle, a sharing, from *particeps*, partaking, from *pars*, part + *capere*, to take). In grammar, a word partaking of the characteristics of a verb and an adjective. Like the verb, it governs nouns or pronouns, and, like the adjective, it agrees in gender, number, and case with the noun or pronoun which it modifies. The double function of the participle is illustrated in such sentences as *μέμνημαι αὐτὸν τοῦτο ποήσαντα*, 'I remember him doing this;' *Flaminio restitit agrum dividenti*, 'he resisted Flaminius dividing the territory.' Participles are either active or passive, and are of various tenses, as present, past (aorist), perfect, and future. In English the active participle coincides in form with the abstract verbal noun, as *going*. The two forms must be sharply distinguished in speech, as, *he is building the house*, but, *forty and six years was this temple in building* (whence such colloquial and archaic forms as *a-building*).

PAR'TICK. A town and western suburb of Glasgow, Scotland, with numerous shipbuilding yards, flour mills, cotton factories, and bleachfields, and 1500 feet of wharfage along the Kelvin River (Map: Scotland, D 4). A large proportion of the inhabitants occupying extensive ranges of handsome villa residences are engaged in business in Glasgow. Population, in 1851, 3132; in 1891, 36,538; in 1901, 54,274.

PARTICULAR BAPTISTS. See BAPTISTS.

PARTIES. In law, in a general sense, those who have personal connection with an affair, or transaction, or who are united in interest in any act or thing; in a specific sense, litigants in a legal action or proceeding. In cases in equity all persons who have a material interest in the subject matter of the proceeding, whether legal or equitable, must be made parties, and persons whose interests are antagonistic cannot be joined as complainants. In an action at law there are generally two parties, or classes of parties, the plaintiff, or complainant, and the defendant, but variations occur, as in attachment cases, in actions *in rem*, etc. In general, any person not under legal disability of some kind, such as an alien enemy, an idiot or an infant, may become a party plaintiff, or may be made a party defendant. For such persons as are under legal disability of any kind the law appoints or allows others to act for them, either in their names or on their behalf. Consult: Dicey, *Treatise on the Rules for Selection of Parties*, etc. (Jersey City, 1886); Barbour, *Summary of the Law of Parties to Actions*, etc. (Albany, 1884); and the authorities referred to under PLEADING; EQUITY; LAW, etc. See also ACTION; DEFENDANT; PLAINTIFF; INFANT; INSANITY; ALIEN.

PARTING. See CLEAVAGE OF CRYSTALS.

PART'INGTON, MRS. A character similar to Mrs. Malaprop in her wrong use of words. Its origin was probably the person of that name described by Sydney Smith in a speech on the position of the House of Lords in reference to the Reform Bill, as attempting to keep back the Atlantic Ocean with her mop.

PARTINICO, pär'tē-nē'kō. A town in the Province of Palermo, Sicily, on the Palermo-Trapani Railroad, 14 miles southwest of Palermo (Map: Italy, H 9). Corn and fruit are produced in the vicinity, and there are manufactures of wine, oil, linen, and woolen goods. Population, (commune), in 1881, 21,000; in 1901, 23,729.

PARTITION (Lat. *partitio*, division, from *partiri*, to divide, from *pars*, part). A division of lands, tenements, and hereditaments, or of goods and chattels, by or for the benefit of per-

sons who have an undivided common interest in them so that each becomes the sole owner of one part or portion of the property. Compulsory partition was first allowed in the early common law as to co-parceners, who became joint owners of real estate by inheritance, on the theory that, as they became joint owners by operation of law, and without their consent, they should be entitled to have it divided if their ideas as to management were not in accord. But as estates held in joint tenancy and tenancy in common were ordinarily created by the voluntary act of the parties, or with their consent, the old rule was that they could only be dissolved in the same way. In the course of time, however, the common-law rules were changed by statute, and since the reign of Henry VIII. all estates held in common have been subject to partition. The English law has continued to be the common law of the United States.

Originally, compulsory partition was obtained by means of a writ of partition, issued from a court of law, but subsequently the courts of chancery assumed jurisdiction; and in most States the action is now considered more in the nature of an equitable action because of the character of the relief obtained. Compulsory partition is now confined almost exclusively to real estate, as personal property, when left by a decedent, is sold and the proceeds distributed by the executors or administrators; and it is seldom held in common except by virtue of a partnership relation, in case of the dissolution of which the sale of the property, or an accounting, is resorted to as the most convenient method of adjusting the rights of the partners.

Where the common owners of property agree upon a partition, it is usually effected by exchanging deeds, each conveying and releasing to the other all his right, title, and interest in and to the portion which the latter is to receive. It is held in some States that a parol partition followed by actual possession of the respective portions of the parties is valid, on the ground that a conveyance is not necessary under the statute of frauds, as each party owned every portion in common with the others, but this is a most doubtful and unsatisfactory method.

Where the parties do not all agree that there should be a partition, and upon the shares to which each should be entitled, one or more of them may commence an action for partition. All parties having any possible interest in the property who do not join as plaintiffs should be made parties defendant. In some cases where the owners in common are all friendly, it is agreed that partition shall be made by the court, and one or more will consent to be made parties defendant, in order to give the proceeding the form of a litigated action. A few States permit all the parties in interest to join in an *ex parte* application to the court for partition, that is, to apply by a petition in the name of all, no one being made party defendant. In all 'friendly' suits the costs are apportioned among the parties according to their respective interests.

The respective proportions or interests of the various parties are first determined, and the court then decides upon the division which will be equitable and just to all. The courts generally favor a division of the property itself where that is possible from its nature and situation. In some cases the courts may make a division of real estate among the interested parties, and order those who receive parcels of greater value than the others to make a certain compensation to the latter. This is sometimes called 'equity equality of partition.' In the actual division and apportionment of lands, values of the respective portions are considered as well as area, and where the action is brought in a court of equitable jurisdiction each party will be allotted the portion which seems best adapted to his interests. A partition sale is conducted on the same principles as any other judicial sale. See REAL PROPERTY; JOINT TENANCY. Consult the authorities referred to under REAL PROPERTY and EQUITY.

PART-MUSIC, or **PART-SONG**. A composition for at least three voices without instrumental accompaniment. The voices may be *equal* (all male or all female) or *mixed*. It is immaterial whether the words are sacred or secular.

PARTNERSHIP (ME. *partener, parcener*, OF. *parcenier*, from ML. *partionarius*, having a portion, from Lat. *partitio*, division). An unincorporated association of two or more persons who have agreed to combine their labor, property, and skill, or some of them, and who, in accordance with this agreement, carry on a lawful trade or business with a view to profit. The term is often used in popular speech, and sometimes in legal documents, with a different signification. We find the first charter of the Levant merchants (granted 1581) designating the grantees as partners; but the association was in truth a corporation, not a partnership. In an early New York case, the Court of Chancery was called upon to decide whether the members of a steamboat company, who had styled themselves partners in their articles of agreement, were partners or part owners (q.v.); and the decision was that they were part owners. It is to be borne in mind, therefore, that partnership is a technical term in legal nomenclature. Persons may be called partners, and even call themselves by that name, without constituting a partnership. On the other hand, they may deny that they are partners, and believe that they are not partners, while in fact the partnership relation does subsist between them. How are we to determine, in a particular case, whether a partnership exists or not?

THE TEST OF PARTNERSHIP. Ordinarily the answer to the foregoing question is not difficult, if we apply the definition given above. First, we inquire whether the association is incorporated. If it is, then it is not a partnership. If it is not, we are next to ask whether the association is a voluntary one; for the law does not institute the relation of partners between persons against their will. Property may be left to children by a parent. This does not make them partners. Each has a right to say whether or not he will combine his interest with the interests of the others in carrying on a common business. The reason for this rule will be apparent when we consider a little later the authority possessed by each partner to sell firm property and to bind his co-partners by contracts and even by torts. It follows from this necessity of a binding agreement between the parties that they must possess legal capacity to contract; and

that the partnership agreement must be of such nature and form as to be legally enforceable. An infant is not bound by a partnership contract. Convicts, alien enemies, and, as a rule, corporations, are prohibited from entering partnerships. Judges are often debarred by statute from becoming partners in law firms. At common law married women were incapable of binding themselves by contract, and consequently could not become partners. Even when the parties have contractual capacity, their partnership contract may be worthless, either because its object is illegal or against public policy, or because its form does not comply with the Statute of Frauds. (See FRAUDS, STATUTE OF.) Courts have properly refused to enforce partnership agreements for highway robbery, for conducting gambling establishments or houses of ill-fame, cornering markets, and for creating monopolies.

The third question to ask is whether the parties are carrying on a business in common. A land-owner often lets his premises to a tenant 'to farm on shares.' This arrangement does not make them partners. Owners in common of a building agree that one of them shall have the general management of it and provide funds for necessary repairs, so as to make it habitable by tenants, and to divide the rent. Such an agreement does not amount to a partnership. If, however, they agree to supply the building with furniture at their joint expense, and to let furnished rooms to various tenants, they may well be held to intend the carrying on of a business in common. The presumption that common owners of land or of interests in land, as well as common owners of chattels, are not partners in their use of it, is due to the fact that such ownership was recognized and the relations of the owners defined by the common law long before the institution of partnership came before English courts for consideration. While it is now possible and even common for partnerships to exist for buying and selling real estate or for renting it, the courts usually require that the intent of joint owners to throw such property into a fund as partnership stock shall be distinctly manifested. Such intent will not be presumed.

Still a fourth question to be answered before a decision as to the partnership character of an association can be reached is whether it was entered into with a view of profit. The earliest form of partnership known to English law was that of ordinary merchants. Its sole object was pecuniary gain. Hence the courts of England and of this country have had no hesitation in declaring that "societies and clubs, organized and maintained for the promotion of temperance, for the enforcement of particular laws, for musical culture among their members, for the propagation of political, social, or religious doctrines, or even for mutual protection or insurance, are not partnerships, even though they may have for one of their objects the accumulation of property to be owned and enjoyed in common."

Formerly, the sharing of the profits of a business was thought to constitute one a partner, at least toward those dealing with the business, whether he was a co-owner in the enterprise or not. This view has been discarded in England and in most of our jurisdictions. A person may share the profits, as a servant or agent, as a lender of money, or as the lessor of property, without becoming a partner. Sharing the profits of a business is *prima facie* evidence that one is a partner; but it is no longer deemed conclusive. It may be overcome by evidence that the sharers are not carrying on the business in common—that they are not its joint proprietors.

CLASSES OF PARTNERSHIP. Various classifications have been made by writers and judges. A general partnership is one organized for the conduct of a business in accordance with the general usages of trade. A particular partnership is confined to a single transaction or enterprise. Joint-stock companies are a form of general partnership at common law, in which the members are allowed to transfer their shares, without dissolving the firm, and the control of which is vested in a few designated managers. Mining partnerships are substantially joint-stock companies. All of these forms are again classified as ordinary partnerships, in contradistinction to limited partnerships.

LIMITED PARTNERSHIPS. This species was introduced into this country from the law of France. It has never gained a foothold in England, although strenuous efforts were made to develop it there after it had proved successful with us. Such efforts have ceased since the organization of joint-stock companies has become popular under modern British statutes. New York was the first of our States to provide by legislation for limited partnership. Connecticut followed this example closely, and now nearly every State has a statute upon the subject. The distinctive characteristic of a limited partnership is the conjunction of at least one general partner, who is liable for all the debts of the firm as every member of an ordinary partnership is, with one or more special partners, whose liability is limited to their contribution to the capital of the firm. In a few States limited partnership associations are authorized. These differ from the regular limited partnership in that their capital alone is responsible for their debts; none of the partners is subject to any personal liability. Both of these institutions, it will be observed, are creatures of statute. Accordingly, if the statutory provisions are not complied with, all the members of the association are liable as general partners. It is impossible to describe with fullness, in this connection, the statutory requirements for the formation of a limited partnership, for they are different in the various States. The chief requirements, however, are these: A certificate must be signed, acknowledged, registered, and published by the partners, stating the name under which the partnership is to be conducted; the general nature of the business to be done; the names and residences of the various members with a designation of the general and of the special partners respectively; the amount of capital contributed by the special partners; and the times at which the partnership is to begin and to end. An affidavit must also be made and filed in the proper office, stating that the sums specified in the certificate to have been contributed by the special partners have been actually and in good faith paid in cash. In some States the capital of the special partners may be contributed in property other than cash.

KINDS OF PARTNERS. In addition to the two kinds of partners designated by limited partnership legislation—the general partner and the

special partner—we have three others, which must be briefly described. The active or ostensible partner is one who frankly avows his membership in the firm, and thereby actively and openly promotes its business. The dormant partner is one who conceals from the public his connection with the firm. In England, and in a few of our States, he may take part in the conduct of firm affairs, without losing his status; but the view prevailing generally in this country is that he must take no part in the business—that both secrecy and inactivity are included in the term 'dormant.' The third kind goes under various names. Sometimes he is called the 'nominal' partner; at others the 'holding-out' partner. Still again he is described as the *quasi* partner, or partner by estoppel. Each of these designations indicates that he is not a partner at all; but still he is liable, as if he were a partner, to those persons who have acted upon his representations that he was a partner and who would be harmed if he were permitted to show the truth of his non-partnership.

THE NATURE OF A PARTNERSHIP. After a partnership has been formed the association is generally spoken of as a firm, and the name in which it does business is called the firm name. Unless a statute forbids, the firm may adopt any name it pleases and may change it at will, or it may go without a name. Occasionally the Legislature prohibits the use of 'and company' or '& Co.' unless such terms represent an actual partner; or it forbids the assumption of a corporate name. Even in the absence of a statute, a partnership is not at liberty to choose a firm name which will operate as a fraud upon the public or upon others trading under substantially the same name. Accordingly, if a business has been conducted successfully under the name of the 'Guinea Coal Company,' another firm will not be allowed to carry on the same line of trade in the name of the 'Pall Mall Guinea Coal Company,' especially if it has its envelopes, letter heads, and business cards so printed as to resemble those of its competitor.

The law merchant treats the firm as a legal entity—as a sort of artificial person much like a corporation. When the partners make their contribution to firm capital they cease to own it as individuals, and title passes to the firm. The firm becomes their debtor for the capital. They lend money to the firm, or borrow from it. The firm, in other words, has its own property, its own creditors, and its own debtors. This conception of the firm prevails very generally among the mercantile classes both in England and in this country. It is always observed by partnership bookkeepers. To some extent it has been recognized by State and Federal statutes, permitting the firm to sue and be sued as an association, and to be declared 'a bankrupt.' The entity theory of partnership, however, has never received full judicial sanction by English or American courts. And American judges, who, in construing mercantile contracts, have given effect as far as possible to the mercantile conception of partnership, have declared "that the firm is not recognized by lawyers as distinct from the members composing it." It follows from this view that if lands are purchased by a firm, the deed should name the partners as grantees; and if the partnership sells lands, the deed should name the partners as grantors, and they and their wives should execute and acknowledge the conveyance precisely as though they were owners in common of the property.

But this conception of a firm, as a mere association of individuals, is not applied consistently in any jurisdiction. For example, we have said that an infant, because of his legal incapacity, is not bound by his agreement to become a partner, nor by the partnership agreement with third persons. Yet, after he has entered a firm and taken part in its management, he is not allowed to withdraw his capital until firm debts are paid. That is, he may escape personal responsibility for partnership obligations, but the firm ownership of firm property prevents his taking away any money or goods which he had contributed to the firm. Again, a partner's share in the firm is not the interest of a tenant in common in specific articles. It is only a *chose in action*—a right to his proportionate share of the net proceeds of firm property upon a final settlement. Accordingly, if the creditor of one partner gets a judgment against him and levies upon firm property, he cannot sell and give perfect title to any particular articles. All that he can dispose of is the judgment debtor's interest therein, which may be something or nothing, and which is nothing whenever the firm is insolvent, or the debtor partner has exhausted his interest in the firm property.

THE POWERS OF PARTNERS. Each member of a normal partnership is the general agent of the firm and of his copartners in carrying on the ordinary business of the firm. He can sell and give a perfect title to firm property, can collect debts, and can subject the firm and his copartners to most extensive obligations both in contract and in tort.

How extensive a general partner's agency is depends upon the nature of the firm's business. His implied authority may be summarized as follows: If the partnership is a trading or commercial firm, he may sell or pledge any of its property; he may buy on credit such property as it is accustomed to deal in; he may borrow money, and issue in the firm name negotiable paper; he may hire servants and agents; and he may render the firm and each copartner liable in tort by wrongful acts or omissions in the ordinary course of the business of the firm. Moreover, his admissions and representations concerning the firm's affairs and in the ordinary course of its business are receivable as evidence against the firm and his copartners who are sued as such.

This implied agency of a partner may be [illegible] [illegible] partnership articles confer the power of [illegible] upon particular members. It may be taken from him without his consent by a majority acting in good faith. Such limitations upon a partner's agency must be brought to the knowledge of those who deal with the firm, or they will not be [illegible].

DUTIES OF A PARTNER. The most important of these is his observance of the utmost good faith towards his copartners. Not only must he give to the firm the benefit of every advantage or gain he can make in the business, but he must devote the whole of his time and energies

ing business hours, to the promotion of its interests, unless he has stipulated in the partnership contract for exemption in these respects. Moreover, if his copartners have been compelled to pay more than their shares of the firm debts and expenses, he is bound to contribute toward their indemnity.

Dissolution of Partnership. This may result by operation of law, or from the acts of the parties, or from judicial decree. The happening of any event which makes it unlawful for the business of the firm to be carried on, or for the particular contracting members to continue as partners, dissolves the firm at once, as does the death or the bankruptcy of a partner. The partnership may terminate by reason of an agreement made in advance that it shall terminate at a fixed date, or at any time by mutual consent. In the United States one partner may break up a firm against the wishes of his copartners, subject to his liability to damages for breach of his partnership contract. A court will ordinarily decree a dissolution, at the request of a partner, upon the insanity or permanent incapacity of a member of the firm, or for the misconduct of one of the defendant partners, or when it appears that the business can only be carried on at a loss. As soon as a firm is dissolved, the agency of the partners ceases, except so far as this is necessary to winding up the firm's affairs. Sometimes a particular member is agreed upon as liquidating partner, to whom exclusive authority in settling firm matters is confided.

Distribution of Firm Assets. In winding up a partnership its assets are to be applied as follows: First, to paying the general creditors of the firm; second, to paying to each partner ratably what is due from the firm to him for advances as distinguished from capital; third, paying to each partner ratably what is due from the firm to him in respect of capital; fourth, the distribution of the residue, if any, shall be among the partners in the proportion in which profits are divided. If losses have been sustained, these are to be paid first out of profits, next out of capital, and lastly, if necessary, by the partners individually in the proportion in which they were entitled to share profits. Of course, these rules may be varied, so far as their application to partners is concerned, by provisions in the partnership articles.

Consult: Bates, *The Law of Partnership* (Chicago, 1888); Bates, *The Law of Limited Partnership* (Boston, 1886); Parsons, *A Treatise on the Law of Partnership* (ib., 1893); Burdick, *The Law of Partnership, Including Limited Partnerships* (ib., 1899).

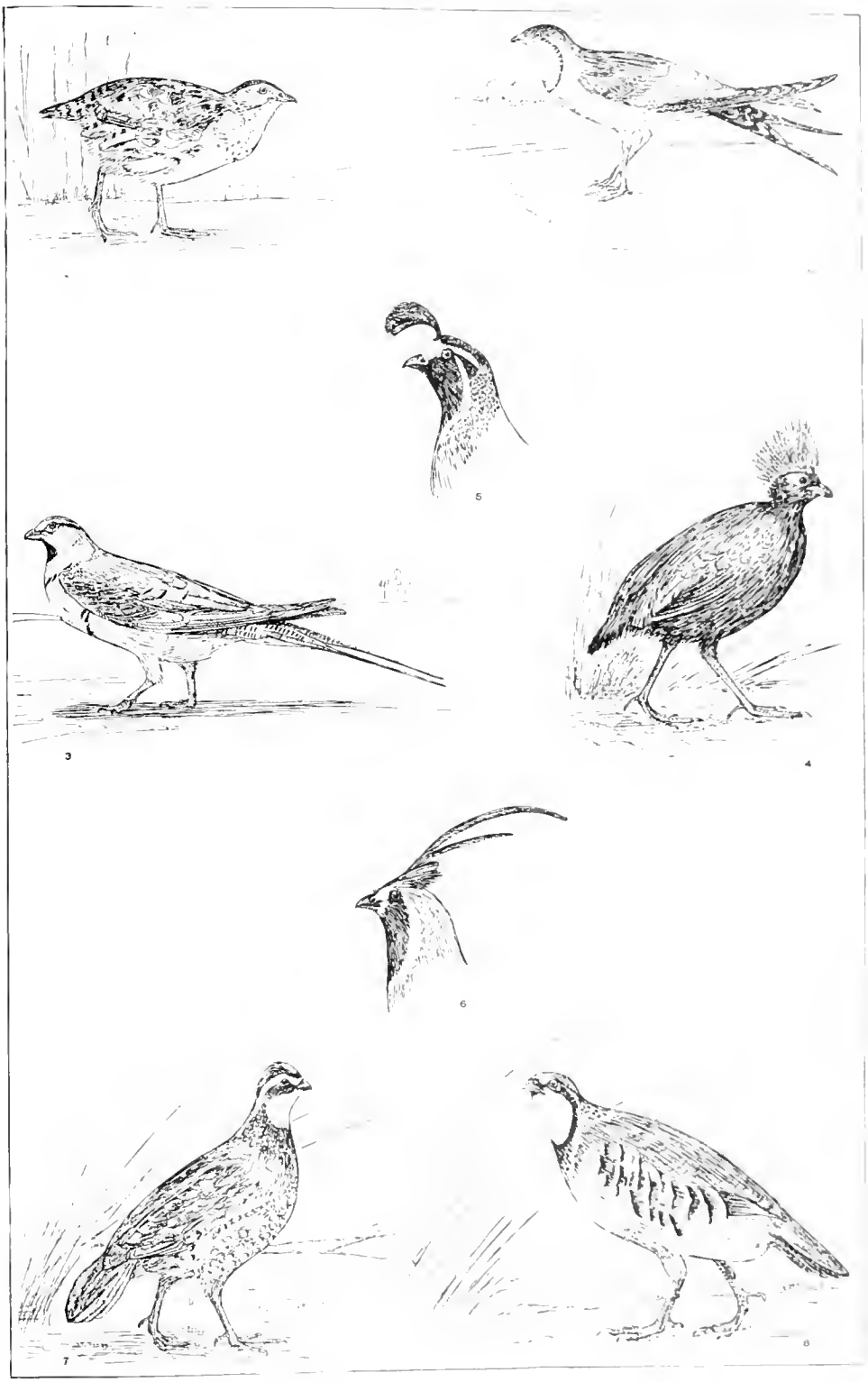
PAR'TON, Arthur (1842—). An American painter, born at Hudson, N. Y. He was the pupil of W. T. Richards in Philadelphia, and was elected to the National Academy in 1884. The coloring in his landscapes is usually in a low key, but his later work, with quite as much quality, has more vigor. His pictures include: "Mountain Brook" (1875); "Nightfall" (1881); "In the Gloaming" (1885); and "Palisades in Winter" (1885).—His brother Ernest (1845—), born at Hudson, was his pupil, and also a landscape painter. Among his works are "Silver and Gold" (1882) and "Last of October" (1886), both characteristic of his refined poetic style of painting.

PARTON, James (1822-91). An American biographer, born in Canterbury, England, February 9, 1822. Parton was brought to the United States in 1827, and was educated in New York City and White Plains, N. Y. He taught in Philadelphia and New York, and began a long literary career by journalistic work on the *Home Journal*. His first book was a *Life of Horace Greeley* (1855), which gained immediate success. He afterwards devoted himself wholly to authorship and to lectures on political and literary topics, residing in New York until 1875, and afterwards at Newburyport, Mass. His principal publications were: *Life and Times of Aaron Burr* (1857); *Life of Andrew Jackson* (3 vols., 1859-60); *General Butler in New Orleans* (1863); *Life and Times of Benjamin Franklin* (1864); *Famous Americans of Recent Times* (1867); *The Words of Washington* (1872); *Fanny Fern*, a memorial to his wife (1873); *Life of Thomas Jefferson* (1874); *Caricature and Other Comic Art in All Times and Many Lands* (1877); *A Life of Voltaire*, his most meritorious production (1881); *Noted Women of Europe and America* (1883); and *Captains of Industry, a Book for Young Americans* (1884 and 1891). In 1856 he married Sara Payson Willis (born at Portland, Me., July 9, 1811; died at Brooklyn, N. Y., October 10, 1872), sister of the poet N. P. Willis, a popular authoress who wrote under the name of 'Fanny Fern.' She left, by a former marriage to Charles H. Eldridge, a daughter, whom Parton afterwards married.

PART OWNER. In its broadest sense, any person who owns property in common with another or others, except partners. Specifically, one of the coöwners of a ship.

Part owners of a ship may transform this ownership into a partnership title by agreement. Such transformation, however, will not be presumed; it must be proved. So long as they remain part owners, they manage the vessel by, and delegate their interests to, various agents, of whom the principal are the ship's husband and the master. Formerly the ship's husband was generally in fact a part owner, but he need not own an interest in the vessel in order that his authority extend to all matters connected with its equipment, repair, and management. A majority of the part owners have the right to use the ship for a particular voyage against the will of the minority. When the majority exercise this power, however, a court of admiralty may require them to secure the minority owners to the extent of their shares. Consult: Lindley, *The Law of Partnership* (London, 1895); Kent, *Commentaries on American Law* (Boston, 1896).

PARTRIDGE (OF. *perdris, perdriz, pertrix*, Fr. *perdrix*, It. *perdice, pernice*, from Lat. *perdix*, from Gk. *πέρδιξ*, partridge). A popular name for various gallinaceous birds, or other birds superficially like them, the precise application of which depends not only on the country, but on the part of the country where the term is used. The name was originally given, and properly belongs, to birds of the grouse family, of the genus Perdix, all of which are confined to the Old World. They have a short, strong bill, naked at the base; the upper mandible convex, bent down at the tip; the wings and tail short, the tarsi as well as the toes naked, the tarsi not spurred. In North America the term is hardly



1. COMMON EUROPEAN QUAIL (Coturnix communis).
2. PRATINCOLE (Glareola pratincola).
3. SAND GROUSE (Pterocles alchata).
4. CROWNED WOOD QUAIL (Rollulus roulroul).
5. CALIFORNIA VALLEY QUAIL (Lophortyx Californ...).
6. CALIFORNIA PLUMED or MOUNTAIN QUAIL (Lophortyx p...ctus).
7. AMERICAN QUAIL or BOB-WHITE (Colinus V...ginianus).
8. RED-LEGGED PARTRIDGE (Caccabis rufa).

applicable properly, as our larger Gallinæ are grouse, while the smaller ones are preferably known as quails, although not precisely the same as the true quails (Coturnix) of the Old World. In the Northeastern United States the ruffed grouse (see GROUSE) is almost universally called 'partridge,' while in the Southern States the common quail (q.v.) receives that name, and the grouse is known as 'pheasant.' The term seems most properly applied in America to the small game-birds of the Pacific Coast, such as Gambel's partridge, and the 'mountain' and 'valley' partridges of California. In South America tinamous (q.v.) are called 'partridges.'

The true partridge of the Old World is typified by the common gray partridge (*Perdix cinerea*) of Great Britain and Europe generally, which is the most plentiful of all the game-birds in Great Britain, and becomes increasingly plentiful as cultivation is extended. On the Continent of Europe it is abundant in almost all suitable districts from Scandinavia to the Mediterranean, and is found also in the north of Africa and in Western Asia. It varies considerably in size; those found in rich lowlands are generally the largest, and about 12½ inches in entire length, while those which inhabit poorer and more upland districts are rather smaller. The female is somewhat smaller than the male. The upper parts of both are ash-gray, finely varied with brown and black; the male has a deep chestnut crescent-shaped spot on the breast, which is almost or altogether wanting in the female. The partridge is seldom found far from cultivated land. It feeds on grain and other seeds, insects and their larvæ and pupæ, and the pupæ of ants are generally the food sought at first for the young. The nest is usually on the ground, among brushwood and long grass, or in fields of clover or corn, and generally contains from 12 to 20 eggs. Until the end of autumn the parent birds and their brood keep together in a *covey;* late in the season several coveys often unite into a *pack*, when it becomes much more difficult for the sportsman to approach them. The flight of the partridge is strong and rapid for a short distance, but the bird does not seem to be capable of long-sustained flight. The eggs of partridges are often hatched, and the young birds reared, by the domestic hen, the chief requisite being a plentiful supply of ants when the birds are very young. Partridges thus reared become very tame, but they seldom breed in the aviary. Other species occur in Asia.

Of a different genus is the red legged or French partridge (*Caccabis rufa*), a native of Southern Europe and now plentiful in the south of England, where it has been introduced. It is rather larger than the common partridge, stronger on the wing, and less easily approached by the sportsman, while it is also less esteemed for the table. The upper parts are of a reddish ash color; the throat and cheeks white, bounded by a collar of black, which expands in black spots on the breast; and the sides exhibit bars of black. The plumage is smooth. Two other species nearly allied to this are found in Southern Europe. India has a number of species, the habits of which much resemble those of the common partridge, the best known of which is the chukor (q.v.). In India, however, the name is extended by sportsmen to a large variety of small game-birds, more or less like the true partridge, such as the bamboo partridges, hill partridges, and tranedins (of which the 'black partridge' (*Francolinus vulgaris* of the Eastern Mediterranean region is a familiar example). In Australia one of the bush-quails (Pedionomus) is so-called, and in South Africa the 'redwing' partridge of the colonists is a tranedin (*Francolinus to Vaillantii*).

Consult general and local ornithologists cited under BIRD; especially Morris, *British Game-Birds* (London, 1891); Allalo, *Sport in Europe* (lib., 1901); Lloyd, *Game Birds and Wild Fowl of Sweden* (lib., 1867); Walsingham, "Shooting," in *Badminton Library* (lib., 1889); Baxden, *Natural and Sport in South Africa* (lib., 1897); Shelley, *Birds of Egypt* (lib., 1872); Seebohm, *Birds of Asia* (lib., 1901); Sharpe and Hudson, *Expedition Ornithology* (lib., 1888); Coues, *Birds of the Northwest* (Washington, 1874); Mayer (editor), *Sport with Gun and Rod* (New York, 1892); Sandys and Van Dyke, *Upland Game Birds* (lib., 1902); and writings of American naturalists and sportsmen generally. See Colored Plates of GAME BIRDS, with article GROUSE, and of EGGS OF WATER AND GAME BIRDS.

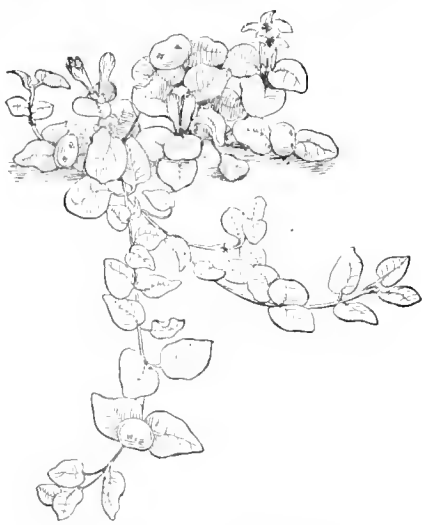
PARTRIDGE, ALDEN (1785–1854). An American educator, born at Norwich, Vt. He graduated at the newly founded Military Academy at West Point in 1806, was commissioned first lieutenant of engineers, and was assigned to duty there as assistant professor of mathematics. From 1813 to 1816 he was professor of engineering. In 1818 he resigned from the army, and in 1820 returned to Norwich, where he founded the American Literary, Scientific, and Military Academy, better known as the Norwich Military Academy. The success of this undertaking was immediate and in 1834 the State granted it a charter as the Norwich University. At the invitation of other States, Partridge founded similar military schools at Portsmouth, Va., Pembroke, N. H., Harrisburg, Pa., and Brandywine Springs, Del., and devoted much time to organizing and drilling their militia.

PARTRIDGE, JOHN (1644–1715). A famous London astrologer and almanac maker. Bound apprentice to a shoemaker, he nevertheless learned by himself Latin, Greek, and Hebrew, and seems subsequently to have studied medicine at Leyden. He wrote a treatise on the *Old Principles of Astrology* in 1697. In 1680 he had begun to issue an almanac called *Merlinus Liberus*, which, after a short suspension, was regularly published from 1689. This masterpiece of equivocation soon became exceedingly popular. As a parody upon it Jonathan Swift issued at the beginning of 1708, *Predictions . . . by Isaac Bickerstaff, Esq.*, in which it was foretold that Partridge would "infallibly die upon March [next, about 11 at night, of a raging fever." On March 30th Swift published a pamphlet in which the prediction was said to be accomplished. In vain Partridge tried to convince the public that he was still alive. Swift followed up the humorous attack in an *Elegy on the Death of Mr. Partridge* (1708) and the *Vindication of Isaac Bickerstaff* (1709). Partridge was so completely crushed that not another *Merlinus* appeared till 1711. Partridge's *Almanac*, issued by the Stationers' Company in 1711, has appeared

regularly ever since. The name Isaac Bickerstaff (q.v.), which Swift took from a sign in Longacre, soon spread far and wide. It was appropriated by Steele in the *Tatler* (1709).

PARTRIDGE, William Ordway (1861—). An American sculptor and author, born in Paris. He was educated at Columbia University, in New York City, and studied modeling under Galli in Florence, and Welonski in Rome. He first became known by his portrait busts, which include "An Old Woman," in the Corcoran Gallery, Washington, and bas-reliefs of Sir Henry Irving (1892) and Edward Everett Hale (Salon, 1893). One of his first large works, the bronze statue of Hamilton in front of the Hamilton Club, Brooklyn, N. Y., is a striking conception of the great statesman in a moment of dramatic interest. It exhibits in a marked degree the restraint that characterizes all his productions. Another notable work is the "Shakespeare," unveiled at Lincoln Park, Chicago, in 1894. His bronze equestrian statue of General Grant (1896) in Brooklyn is a model of unity and technical ability. His largest ideal work is the Kauffman Memorial at Washington. Other busts include a noble "Madonna" (1897), Whitman, Lincoln, Whittier, "Dreams," and "Midsummer Night's Dream." Mr. Partridge also became well known as a lecturer and writer on art and letters and municipal improvements. His publications include: *Art for America* (1894); *Song Life of a Sculptor* (1894); *The Technique of Sculpture* (1895); *The Angel of Clay* (1900), a novel; and *Nathan Hale* (1902). For a time he was professor of fine arts at Columbian University, Washington, D. C.

PARTRIDGE-BERRY, or Checker-Berry. Members of the genus Mitchella, of the natural order Rubiaceæ (madder family), represented by one species in America and one in Japan. The



Partridge Berry (*Mitchella repens*).

American species, Mitchella repens, which extends from Canada to Mexico, is a small trailing evergreen, with a branching stem, a foot or more long, usually covering the ground. It is named in honor of Dr. John Mitchell, a Virginian botanist, correspondent of Linnæus. Its favorite habitats are dry, sandy knolls in piney woods, but it may be found in most dry woods. Its leaves are smooth and shining, round-ovate, opposite with short petioles, and traversed with light lines; flowers in pairs with ovaries united. The fruit is a beautiful scarlet berry crowned with the calyx teeth of the two flowers, each with four small seed-like and bony nutlets. The berry, which is about the size of that of the wintergreen, but almost tasteless, remains on the plant during the winter. Blossoms appear in June and July.

PARTRIDGE DOVE, or Partridge Pigeon. An Australian pigeon of the genus Geophaps, approaching in character and habits to the gallinaceous birds, and particularly to partridges. The plumage has a bronze tinge and lustre on the wings, which resembles that of the closely allied bronzewings (q.v.). There are several species. They live mostly on the ground, and rise with a whirring noise, like the pheasant, when disturbed. They are highly esteemed for the table. *Geotrygon montana*, a species of another genus, bears the name 'partridge dove' in the West Indies. It also seeks its food chiefly on the ground, although it affects well-wooded districts.

PARTRIDGE-WOOD. A very pretty, usually reddish, variously streaked hard wood from the West Indies and Brazil, where it is used in shipbuilding. In choice specimens the layers of wood are curled upon one another so as to resemble the feathers of the partridge; hence its name. Its chief use in other countries is for cabinet-work, parasol-sticks, fans, and other small articles. It is said to be yielded by *Andira inermis*, a leguminous tree.

PARTS OF SPEECH. See the section on *Parts of Speech*, under Grammar.

PARTURIENT APOPLEXY. A disease of live stock. See Milk Fever.

PARTURITION. See Obstetrics.

PARTY NAMES (OF., Fr. *partie*, from ML. *partita*, party, part, Lat. *partita*, fem. sg. of *partitus*, p.p. of *partiri*, to divide). The following is a partial list of the political groups which have existed in the United States, some of which, however, were never definitely organized as parties.

Abolitionists.—Those who strove to secure the abolition of slavery. (See article on this title.) *Adamites.*—The political supporters of John Quincy Adams. The expression was current from about 1821 to 1832. *American Party.*—A party which originated in New York in 1835, and which was organized as a national party about 1852. Its purpose was expressed in the motto, 'America for Americans.' Later it became known as the 'Know-Nothing Party.' The name was also applied to two other parties in the history of the United States. (See American Party, and Know-Nothings.) *Anti-Federalists.*—The name applied to those who opposed the adoption of the Constitution of the United States and who later opposed the liberal construction of that instrument. (See Anti-Federalists.) *Anti-Imperialists.*—(See Imperialism.) *Anti-Masons.*—A party which originated in New York in 1826, its chief principle being hostility to the Masonic Order. (See Anti-Masons.) *Anti-Nebraska Party.*—A party formed in 1854 after the enactment of the Kansas-Nebraska Bill and

composed mainly of Northern Whigs, who were opposed to the repeal of the Missouri Compromise. *Anti-Renters.*—The name applied to those in New York who opposed the collection of rent from the tenants occupying the old patroon estates. The movement flourished during 1839-47. (See ANTI-RENTISM.) *Barnburners.*—The radical wing of the Democratic Party in New York for several years after 1844. They were arrayed against the Hunkers (q.v.) or the moderate wing. (See BARNBURNERS.) *Black Republicans.*—The name applied, chiefly in the South at the close of the Civil War, to those supporting the Republican Party, on account of their sympathy for the negro. *Bourbons.*—Originally applied to the Southern Democrats of the old school, but now used of any reactionary who adheres obstinately to tradition. *Bucktails.*—A political faction originating in New York in 1815, and opposed to the administration of Governor Clinton. They were so called from the habit of wearing bucktails in their hats. *Carpet-Baggers.*—See article on this title. *Constitutional Union Party.*—A party organized in 1860 and composed mainly of former Southern Whigs. (See CONSTITUTIONAL UNION PARTY.) *Copperheads.*—The name applied by the Republicans during the Civil War to the Democrats of the North who did not believe in prosecuting the struggle with the South, and some of whom sympathized with the cause of the Confederates. (See COPPERHEADS.) *Coöperationists.*—The term applied at the time of the secession controversy in the Southern States to those who favored the secession of their own State only in the event of 'coöperation' of their sister States. *Court Party* (old and new).—The term applied to the supporters of two rival superior courts in Kentucky. (See KENTUCKY.) *Democratic Republicans.* See DEMOCRATIC PARTY. *Democrats.*—See article on DEMOCRATIC PARTY. *Doughfaces.*—The name sneeringly applied by John Randolph of Roanoke, about 1820, to Northern members of Congress who supported the slavery interests by their votes. *Drys.*—Another term for those favoring the prohibition of the liquor traffic. *Federalists.*—See article on this title. *Free Soilers.*—A party which first came into prominence in 1848. It was made up of men opposed to the extension of negro slavery. (See FREE-SOIL PARTY.) *Gold Democrats.*—A party of disaffected Democrats who refused to support the regular party platform and candidates in 1896. They adopted a platform favoring the gold monetary standard and nominated J. M. Palmer, of Illinois, for President. *Grangers.*—See article on this title. *Greenbackers.*—A party advocating the issue of an irredeemable paper currency. It was prominent during the decade from 1876 to 1886. (See GREENBACK PARTY.) *Half Breeds.* The moderate wing of the New York Republicans, 1881-85, opposed to the Stalwarts (q.v.). *Hunkers.*—See HUNKERS. *Jacksonites.* The followers of Andrew Jackson, 1825-29, opposed to the *Adamites*. *Know-Nothings.*—See article on this title. *Liberals or Liberal Republicans.* Those Republicans who opposed the reëlection of President Grant in 1872, and favored a more liberal policy as regards the Southern question. (See LIBERAL REPUBLICAN PARTY.) *Liberty Party.*—A party which was formed about 1840 for the purpose of securing the abolition of slavery. (See article on this title.) *Lily Whites.*—The term applied to white Republicans in the South who favor the exclusion of negroes from the party. *Loco Focos.*—A popular nickname given to a faction of the Democrats in New York about 1835. (See article on this title.) *Loose Constructionists.*—The term applied frequently to the Federalists and later to the Whigs, on account of their advocacy of a liberal interpretation of the Constitution of the United States. *Mahonists.*—A party in Virginia consisting of the followers of Gen. William Mahone, who bolted from the Democratic Party in 1878. (See READJUSTERS.) *Middle-of-the-Road Populists.*—See POPULIST PARTY. *Mugwumps.*—See article on this title. *National Republicans.*—See WHIG PARTY. *Native Americans.* See the article KNOW NOTHINGS. *Nullifiers.* Those who advocated the right of a State to suspend within its own boundaries the operation of a law of the United States. Only in South Carolina, 1828-32, did this become the basis of a party organization. (See article on NULLIFICATION.) *People's Party*, or *Populist Party.*—A political party first organized on national lines in 1892. (See article on POPULIST PARTY.) *Prohibitionists.*—Those who advocate abolition of the liquor traffic. Since 1872 there has been a national Prohibition Party. (See article on PROHIBITION.) *Radicals.*—The name applied after the Civil War to the extreme wing of the Republican Party as regards its policy in dealing with Southern questions. *Readjusters.*—A local party in Virginia in 1878 headed by Gen. William Mahone, and favoring a conditional repudiation of the State debt. (See article on READJUSTERS.) *Repudiators.*—A party in Mississippi which advocated the repudiation of a large number of Union bank bonds, the payment of which the State had guaranteed. (See article on REPUDIATION.) *Relief Party.*—The name applied to the supporters of a movement in Kentucky which had for its purpose the enactment of measures by the Legislature for relieving the people of economic and financial burdens. 'Relief' parties were common in other States from 1830 to 1860. (See KENTUCKY.) *Republicans.*—See article on the REPUBLICAN PARTY. *Scalawags.*—The name applied to native Southerners during the reconstruction era who affiliated with the Republican Party. *Silver Grays.*—The conservative wing of the Whig Party. *Silver Party.*—A party made up chiefly of disaffected Republicans in 1836, who favored the free coinage of silver. It indorsed the Democratic nominees for President and Vice-President in that year. *Socialists*, or *Socialist-Labor Party.*—This first appeared as a national movement in 1892, when it nominated candidates for President and Vice-President, and adopted a platform advocating a socialistic policy in governmental affairs. *Stalwarts.*—A wing of the Republican Party in New York from 1880 to 1885, led by Roscoe Conkling, and representing the 'machine' politics of the party. (See article on this title.) *Strict Constructionists.*—The name given to those who advocated the strict interpretation of the Constitution of the United States. *Union Labor Party.*—A movement which first became national in 1888. It nominated candidates for President and Vice-President and adopted a platform of principles. *Union Leagues.*—Organizations of a political character in the Southern States for a time after

the Civil War, composed chiefly of negroes and white Republicans. *Washingtonians.*—The term early applied to the Prohibition Party. *Whigs.*—See WHIG PARTY. *Woman's Rights Party.*—A party which first appeared as a national movement in 1884. Both in that year and in 1888 it held national conventions and nominated candidates for President and Vice-President, pledged to advocate the general introduction of female suffrage.

PARTY WALL. A wall dividing adjoining properties and owned in common by the owners of the properties or so that they have common rights in its use and maintenance. By the English common law, where the wall is partly on both lots, the adjoining proprietors are regarded as tenants in common of the wall, and probably of the land on which it stands, during the existence of the wall. In the United States, if the wall stands so that it is partly on both lots, the owner of each lot retains the fee in the part of his land covered thereby, and also owns the portion of the wall standing on his lot, subject, however, to the easement of support incident to a party wall, in favor of the adjoining owner, and he has reciprocal rights in the other portion of the wall.

A party wall may, like any other easement, be created by grant, by prescription, or twenty years' user, and in a few States by virtue of statutes authorizing a person to build a party wall between his land and that of another and exact contribution from the latter under certain circumstances. The weight of authority in the United States is to the effect that statutes of the nature above referred to are unconstitutional, as taking private property without compensation, especially as it is for private purposes. In the few States where such statutes exist they are held valid as a legitimate exercise of the police power. Neither owner of a party wall has a right to extend the front and rear walls of his building farther than to the middle of the party wall, nor can either maintain a window therein, even if the other party is not using his side. Either owner may increase the height of a party wall, provided the wall is thick enough "to bear the increased weight, or may increase its thickness on his own land." When a party wall becomes unsafe or dangerous, either party may repair it, even to the extent of rebuilding it, without causing injury to the other; but the one repairing or rebuilding cannot in general require the other to pay his proportionate share of the cost thereof. In most jurisdictions it is held that if the wall is totally destroyed by any cause the easement is at an end, and neither party can rebuild without the consent of the other. Consult the authorities referred to under EASEMENT and REAL PROPERTY.

PĀRVATĪ (Skt., mountain-born). In Hindu mythology, the beneficent aspect of the wife of Siva (q.v.). She was a reincarnation of Uma (q.v.), and was born as a daughter of Himavant or the Himalaya Mountain, from which circumstance she received her name. According to another account, she was the daughter of the combined glances of Brahma (q.v.), Vishnu (q.v.), and Siva, and was born on Mount Kailasa in the Himalayas. She was then white, red, and black, the colors of Brahma, Vishnu, and Siva respectively, but at Brahma's request divided herself into three forms, of which the white, Sarasvati, was the wife of Brahma; the red, Lakshmi (q.v.), the wife of Vishnu, and the black, Parvati, the wife of Siva. Parvati plays little part in Hindu mythology, manifesting her power chiefly under her aspects of Durga (q.v.) and Kali (q.v.). Consult Wilkins, *Hindu Mythology* (2d ed., London, 1900), and see, for illustration, Plate of HINDU DEITIES in the article INDIA.

PAR'VIN, THEOPHILUS (1829-98). An American obstetrician. He was born in Buenos Ayres, was a graduate of the universities of Indiana and of Pennsylvania, and, after a dozen years' practice in Indianapolis, became professor in the Ohio Medical College (1864). From 1869 to 1872 he taught in the medical department of the University of Louisville; then was professor of obstetrics and infantile diseases in Indiana Medical College, and in 1883 was chosen to a like chair in Jefferson Medical College, Philadelphia. He wrote *The Science and Art of Obstetrics* (1886), and edited *Winckel on the Diseases of Women* (1887).

PAS'ADE'NA. A city in Los Angeles County, Cal., 10 miles northeast of Los Angeles, on the Southern Pacific, the Atchison, Topeka and Santa Fe, and the Salt Lake railroads (Map: California, D 4). It is an attractive residential place and a well-known winter resort, its healthful climate and beautiful situation contributing to its popularity. Green Hotel, Maryland Hotel, Hotel La Pintoresca, and Raymond Hotel, are among the most prominent buildings of Pasadena. There are also the Throop Polytechnic Institute, and a public library that contains over 20,000 volumes. The Pasadena Academy of Sciences possesses a valuable museum of archæology and natural history. The city has voted (1903) $300,000 for parks and other improvements, besides $100,000 for a new high school building. Pasadena was settled in 1874 by a colony from Indianapolis and soon became known for its horticultural enterprise. It is the centre of extensive fruit-growing interests, the cultivation of oranges and lemons being especially prominent. There are large packing houses, many drying establishments, a large cannery, and manufactures of woodwork, boots and shoes, and brick. Pasadena was first incorporated in 1886. It is governed, under a charter of 1901, by a mayor, elected every two years, and a unicameral council. Population, in 1890, 4882; in 1900, 9117.

PASAR'GADÆ (Lat., from Gk. Πασαργάδαι, possibly from OPers. **Pārsa-vardana*, city of Persia, equivalent in meaning to *Persepolis*). The ancient capital of Persia, before the foundation of Persepolis. Its site is generally supposed to have been on the Plain of Murghab northeast of Persepolis, where there is an ancient tomb which the best authorities all believe to be the tomb of Cyrus. The neighborhood was the burial place of the Achæmenian kings and the ancient tribe called Pasargadæ dwelt in the vicinity. The region was the home of the royal family of the Achæmenidæ. Consult Curzon, *Persia and the Persian Question* (London, 1892); and the authorities referred to under PERSEPOLIS.

PASCAGOULA, păs'kȧ-gōō'lȧ. A river of Mississippi, formed by the junction of the Leaf

and the Chickasawhay, both flowing southward through the southeastern part of the State (Map: Mississippi, H 9). It empties through a beautiful estuary into Mississippi Sound at Scranton, near the Alabama boundary. With its main headstream, the Chickasawhay, it is 250 miles long, and navigable 100 miles for small steamers. It is the outlet for the lumber cut in the large pine barrens through which it flows.

PASCAL, pȧ'skăl'. BLAISE (1623-62). A distinguished French philosopher, mathematician, and author, born at Clermont-Ferrand. He came of an Auvergnat family, ennobled in 1478, and for generations occupied in the civil service. His mother died in his infancy, and his father moved in 1631 to Paris. Here he was educated by his father, and showed remarkable precocity in mathematics. In 1641 the family removed to Rouen, where for a number of years Pascal was engaged in scientific studies, especially in physics. In 1648 his sister Jacqueline was attracted to the Jansenist convent at Port-Royal, and Pascal frequently accompanied her there, till their father took them both to Clermont, where Pascal remained for two years. In 1650 the family returned to Paris, and the next year the father died; Jacqueline joined Port-Royal, but Pascal remained in Paris till 1654, when he followed her thither. His decision to embrace the austere life of Port-Royal is said to have been caused by a carriage accident, though it is quite clear from minor writings of this period, such as *Prière pour demander le bon usage des maladies* (1648), and *Lettres sur la mort du père de M. Pascal* (1651), that the Jansenist faith and what is uncritically called Pascal's skepticism were already firmly fixed in his mind. From this moment he gave himself utterly to Port-Royal, continuing to believe in and labor for the progress of science, though sure that mental and moral certitude could be found only in revelation. He was not then a theologian, and he never acquired more than a superficial acquaintance with the Fathers of the Church. Yet, with the equipment of his unsurpassed literary instinct and scientific training, he entered on his famous controversy with the Jesuits in the eighteen *Lettres provinciales*. They were published clandestinely and pseudonymously in 1656 and 1657. The title of the collected letters reads: *Lettres écrites par Louis de Montalte à un provincial de ses amis et aux RR. PP. Jésuites; sur la morale et la politique de ces pères.* Subsequently the collection was entitled simply *Les provinciales*. It is evident that they were written under intense excitement, stimulated by the supposed miraculous cure of his niece through contact with a relic of the crown of thorns at Port-Royal. The letters were immensely popular and successful, but brought down both ecclesiastical and civil censures upon the unknown author. They are perhaps the greatest masterpieces in the literature of irony; there is no trace of declamation or of indignation, only a contemptuous smile, an insinuation of sarcasm, which in the latest letters yields occasionally to a stern but not impassioned invective, less effectual and less agreeable than the earlier manner. Pascal's style is unsurpassed in graceful energy and brilliant wit. It lacks tenderness and melody, but has the characteristically French virtues of being sharp, clear-cut, compact, and yet full in its utterance. He is the first French prose-writer thoroughly at home with rhetorical tools. There has been gradual adaptation to new needs, but French prose has neither made nor needed to make a great advance since the *Lettres provinciales*. Considered, now or, from the point of view of honest controversy, they cannot be praised too highly. At best they are special pleadings, and do not represent the general spirit of the Jesuit Order. Accurate scholarship has pointed out numerous passages which misquote or misapply the authors quoted, or distort an *obiter dictum* of some obscure Jesuit, sometimes even a proposition condemned by the Society, into its official teaching. His colleagues at Port Royal, especially Nicole, furnished materials and collected references, and others were taken from a Calvinist collection published at Geneva in 1632. Pascal's part was that of the earnest and convinced barrister who pleads a case from materials put into his hands by others. He himself said, it is true, that he had read Escobar through twice, and had never used a passage from any author without having looked it up with its context. The real issue, however, is not between Jesuits and Jansenists, but between Puritanism and Probabilism. Pascal leads an ascetic reaction against the naturalism of the sixteenth century as we find it, on the one hand, in Rabelais and Montaigne, and, on the other, in Ronsard and the Classicists. This double movement of the Renaissance the Jesuits had sought to reconcile with Christianity by their ethics. Against this Pascal makes a Puritan and Augustinian protest, somewhat as Calvin had made it in a previous generation. The critic Brunetière thinks that Pascal made a mistake in scoffing at casuistics, while he attacked Probabilism, and that in seeking to ruin the moral credit of the Jesuits he directed a blow against religion itself, which might have had serious consequences had it not been in some degree parried by Pascal's second great work, *Pensées sur la religion et sur quelques autres sujets* (1670).

For Pascal had not yet finished *Les provinciales* when he conceived the idea of supplementing this destructive work of criticism by a constructive *Apologie de la religion chrétienne*, by which, of course, he meant Jansenism. At this he worked serenely, though with much physical suffering, and some self-inflicted refinements of asceticism, until his death, in 1662. He left it little more than a series of disconnected fragments, published with omissions, alterations, and some errors of mere carelessness in 1670. A more exact text, edited by Faugère, appeared in 1844. The general idea of the work is obvious if we conceive it to be a book of Jansenist apologetics. Pascal urges the wretchedness of man in himself and in his environments, the impotence of reason, the protest of despair, the invincible hope of better destiny, the solution of the difficulty in the doctrine of original sin, and the consequences of the acceptance of that doctrine, namely, expiation and redemption, dogmas foreshadowed in the Old Testament, confirmed by miracles, forming the essentials of Christianity, and credible by an effort of will.

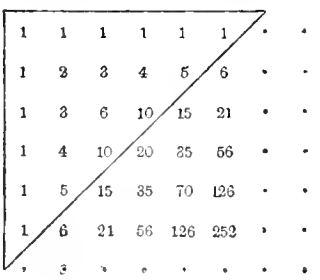
Pascal's work in mathematics was also of considerable importance. He was the first one to attempt a philosophy of mathematics. When only sixteen years old, he wrote a work on the *Conic Sections* (1639), most of which is lost, though a fragment has been restored from its correspondence with Leibnitz. It contained

two important theorems, the one which is known as Pascal's theorem (see CONCURRENCE AND COLLINEARITY), and another, due to Desargues, that if a straight line cut a conic in P and Q, and the sides of an inscribed quadrilateral in A, B, C, D, we have the following relations: $\frac{PA \cdot PC}{PB \cdot PD} \frac{QA \cdot QC}{QB}$. In 1665 he published his arithmetical triangle, a device for determining the coefficients of the expansion $(a + b)^n$. (See PASCAL'S TRIANGLE.) The theory of probabilities (see PROBABILITY) assumed form under the hands of Pascal and Fermat (q.v.). Pascal's last work dealt with a curve called by him the roulette, and known later as the cycloid (q.v.). The best study of his scientific works is Desloves, *Etude sur Pascal et les géomètres contemporains* (Paris, 1878).

There are modern editions of *Les provinciales* by Lesieur (1867), Saey (1877), Soyres (1880), Derôme (1880-86), Brunetière (1896), and others. Of the *Pensées* may be mentioned here the modern editions by Molinier (1877-79), Guthlin (1896), Michaut (1896), and Brunschvieg (1897). With the *Pensées* are usually included the chief minor works, *Entretien avec M. De Saci*, *Discours sur la condition des grands*, *L'esprit géométrique*, *Préface d'un traité du vide*, and the Letters to Mlle. de Roannez. Both *Les provinciales* and the *Pensées* have been frequently translated. An elaborate and, it is hoped, definite edition is being prepared by Boutroux. A full bibliography may be found in Petit de Julleville, *Histoire de la langue et de la littérature française* (Paris, 1896 et seq.). There are biographies and studies of Pascal by Condorcet (1776), Bossuet (1779), Sainte-Beuve in his *Port-Royal* (5th ed., 1887), Maynard (1850), Cousin (5th ed., 1858), Bertrand (1891), Sourian (1898), and Boutroux (1900). Consult also: Tulloch, *Pascal* (London, 1878); Vinet, *Studies on Pascal* (Eng. trans., Edinburgh, 1859); Nasmith, *Pascal* (New York, 1892); Clark, *Pascal and the Port-Royalists* (ib., 1902); Parsons, *Studies in Church History* (ib., 1896); Dreydorff, *Pascal, sein Leben und seine Kämpfe* (Leipzig, 1870).

PASCAL'S THEOREM. See CONCURRENCE and COLLINEARITY.

PASCAL'S TRIANGLE. A device studied by Pascal for the determination of the coefficients of the expansion $(a + b)^n$, where n is any positive integer. The triangle is constructed in the following way:



where every number is equal to the sum of the numbers to the left and immediately above it, the figures in the nth diagonal extending upward from left to right in the coefficients of the expansion $(a + b)^n$.

PASCHAL, păs'kal. The name of two popes. PASCHAL I., Saint, Pope 817-824. The chief general importance of his pontificate lies in his relations with Louis le Débonnaire, who in 817 gave him concessions, the record of which forms the earliest extant document concerning the temporal possessions of the Roman See. In 823 he crowned Louis's son Lothair as 'Augustus' or coregent with right of succession to the Empire. His letters are in Migne, *Patrologia Latina*, cii. Consult Simson, *Ludwig der Fromme* (Leipzig, 1874-76).—PASCHAL II., Pope 1099-1118, Raniero di Bieda. As a monk of Clugny, he came to Rome on business for his Order, and on account of his usefulness was detained there. Gregory VII. made him a cardinal. On his election to the Papacy, he was opposed by an antipope claiming the title of Clement III., and three others followed before the schism was extinguished. His administration was marked by vehement conflicts with the civil power which concentrated in the question of investiture (q.v.). The Emperors Henry IV. and Henry V. and King Henry I. of England were his principal opponents; Philip I. of France was also excommunicated for his illegal union with the wife of Fulk of Anjou, but finally submitted and was reconciled.

The name of Paschal was also borne by two antipopes. One opposed Sergius I. from 684, but in 687 was deposed and shut up in a cloister, where he died in 692. The other, who took the title of Paschal III., was set up in 1164 by the faction of Frederick Barbarossa and died in 1168. He is chiefly remembered for having canonized Charlemagne at the instance of Frederick.

PASCHAL CHRONICLE (Lat. *Chronicum Paschale*). A chronicle compiled in part from the Paschal canons (rules for the Easter festival) of various districts and towns, and containing a summary of events in chronological order from Adam to A.D. 629, which was the twentieth year of Heraclius. It was at one time named also *Alexandrinum*, because then attributed to a writer of Alexandria. The name of the author, however, is not known. It at first extended, according to the opinion of some, only to A.D. 354, in the reign of Constantius, the continuation of it with additions to the first part being the work of a later compiler. Others, however, regard it all as the work of one man. The manuscript in which it now exists (in the Vatican) is Byzantine work of the eleventh century. It is sometimes called also *Fasti Siculi*, because it was found in an old library in Sicily, from which it was taken to Rome. Notwithstanding its numerous faults, both of matter and style, it contains much valuable chronological information. There is a convenient edition in two volumes (Bonn, 1832).

PASCHASIUS (păs-kā'sĭ-ŭs) **RADBERTUS.** A distinguished theological writer of the Carolingian Age. He was born about the end of the eighth century, near or in Soissons. In 814 he joined the Monastery of Corbie, of which he was subsequently elected abbot. He was a member of the Synod of Paris, and took part in the Assembly of Chiersy in 849. Two years afterwards he resigned his position as abbot and devoted himself entirely to literary work. The

most important of his writings are *De Corpore et Sanguine Domini,* which caused a prolonged controversy on the doctrine of the Lord's Supper; *Expositio in Lamentationes Jeremiæ;* and *De Fide, Spe et charitate.* His works were published collectively at Paris in 1618 under the editorship of Girmond.

PASCO, pä'skō, Cerro de. A city of Peru. See Cerro de Pasco.

PAS-DE-CALAIS, pä-de-kȧ'lâ' (Fr. for Strait of Dover). A department in the north of France, embracing most of the old Province of Artois and part of Picardy, bounded on the north by the Department of Nord and the Strait of Dover, and on the west by the Strait of Dover and the English Channel (Map: France, J 1). Area, 2606 square miles. Population, in 1896, 906,249; in 1901, 955,391. The surface is level, with the exception of a ridge of hills running from the southeast to the northwest, ending in Gris-nez Cape (q.v.), and forming the watershed between the North Sea and the English Channel. The highest point (695 feet) is reached a little to the southwest of Desvres. The rivers, which are of no considerable length, are the Scarpe and Lys in the basin of the North Sea, and the Authie and Canche belonging to the basin of the English Channel. The rivers are navigable within the department, and are connected by canals. The coast-line is 80 miles in length, and the shores are in certain parts low and sandy; while for several miles on either side of Gris-nez cliffs similar to those of Dover front the sea. The climate is mild, but variable. The soil is fertile—all the usual cereal and leguminous crops being produced in abundance. Fishing is actively carried on along the coast, particularly in the neighborhood of Boulogne. Coal of an indifferent quality is obtained, excellent stone is quarried, and considerable quantities of turf are cut. The industrial establishments are numerous and important, including iron foundries, glass works, potteries, tanneries, bleach works, and mills and factories of various kinds. Boulogne and Calais are the principal ports. Capital, Arras.

PASDELOUP, pä'd'-lōō', Jules Étienne (1819-87). A French musical conductor, born in Paris. At ten years of age he entered the Paris Conservatoire, and in 1834 won the first prize for his piano-playing. He held a Government position after 1848, but three years later began the formation of an orchestra composed of conservatory students whom he trained to produce the symphonies of the best French and foreign composers. This was the beginning of the 'concerts populaires' which from their foundation in 1861 truly merited their name. The Legion of Honor and other marks of distinction were conferred on him, and his Sunday concerts were subsidized by the Government and were carried on for more than twenty years. Pasdeloup managed the Lyric Theatre (1868-70) and was an instructor at the Conservatoire in 1847-50, and again in 1855-68.

PASEWALK, pä'ze-välk. A town of Pomerania, Northern Prussia, situated on the Ucker, 22 miles northwest of Stettin (Map: Prussia, E 2). It contains several churches, and a bronze statue of Frederick III. erected in 1895. The manufactures include tobacco, starch, flour, oil, and plaster, and there are iron foundries and saw mills. Population, in 1900, 10,299.

PASHA, pȧ-shä' (Turk. *pasha,* from Pers. *pāsha, pād-shāh,* king, from *pād,* protector, master (connected with Skt. *pati,* Lith. *patis,* lord, Lat. *potis,* able) + *shāh,* OPers. *xshāyathiya,* king, connected with OPers. *xshatra,* Av. *xshathra,* Skt. *kshatra,* kingdom, from *kshi,* to rule), or Bashaw. A title used in the Ottoman Empire, originally bestowed upon members of the royal family only. It is now used also for high civil and military officers. Of the latter there are three grades, symbolized by the number of horse-tails formerly borne before them on occasions of state. Three tails signify general-in-chief, two tails general, and one brigadier. The actual symbols were abolished by Mahmud II. (1808-39), but the grades still exist. Admirals also have the title pasha. Civil officers of the rank of Vizier, provincial governors, and others also receive the title. The province governed by a pasha is known as a pashalik or vilayet. The authority of the pasha in his province was formerly absolute, but it is now held in check by local councils, and the Sultan may at any moment remove the pasha and even put him to death.

PASHIUBA PALM. See Iriartea.

PASHKOFF, pash'kŏf, Vasili Alexandrovitch (?-1902). A Russian religious reformer, founder of an evangelical sect, called after him the Pashkovski. An officer of the Imperial Guard and with high connections, he was brought to accept Lord Radstock's views of primitive Christianity (1874); founded an association for the encouragement of religious reading (1876), which was abolished about ten years later; and did a simple and unassuming evangelical work in which he met with great success, especially among his own class. Almost his entire fortune he spent in wise charity. During the reign of Alexander II., with whom Pashkoff was personally intimate, the work was uninterrupted; but in 1884 he was forced into exile, first from Saint Petersburg and then from Russia, the immediate occasion being his attempt to unite the Stundists and Baptists of the south with his own northern sect by means of a simple creed. He afterwards lived in Austria, England, and France.

PASHTU, päsh'tōō, or **PUSHTU,** pōōsh'tōō. See Afghans.

PÁSIG, pä'sēg. The outlet of the Laguna de Bay, in Luzon, Philippine Islands. See article Manila.

PASIG. The capital of the Province of Rizal in Central Luzon, Philippines (Map: Luzon, E 8). It is situated near the northwestern corner of the Laguna de Bay, seven miles east of Manila. The city was burned during the insurrection of 1897, and only a few well-built stone houses remain, the majority of the people living in bamboo or nipa huts. Population, 22,000.

PASINI, pȧ-sē'nē, Alberto (1826-99). An Italian landscape and figure painter, born at Busseto, near Parma. He came to Paris about 1840 and first studied lithography. Afterwards he became a pupil of Ciceri, Isabey, and Théodore Rousseau. He traveled much in the East, particularly Turkey and Persia, and took most of his subjects from those countries. His pictures are full of atmosphere and color, and as characteristically Oriental as those of Gérôme.

He was awarded the medal of honor at the Paris Exposition of 1878. An excellent example of his work is the "Entrance to a Mosque," in the Metropolitan Museum, New York City.

PASIPHAË, pā-sĭf'ā-ē (Lat., from Gk. *Πασιφαη*). In Greek mythology, the daughter of Helios and sister of Circe. She was the wife of Minos, but, in consequence of his neglect to perform a certain vow, Poseidon rendered her enamored of a bull, and she became the mother of the Minotaur. See MINOS; MINOTAUR.

PASITH'EA (Lat., from Gk. *Πασιθεα*). The wife of Hypnos, and one of the Graces.

PASKEVITCH, pȧs-kā'vĭch, IVAN FEODOROVITCH, Count of Erivan, Prince of Warsaw (1782-1856). A Russian field-marshal, born at Poltava. He belonged to a Polish family, was a page of the Emperor Paul, and, entering the army in 1800, served in the campaign of Austerlitz. He fought subsequently against the Turks. He was also actively engaged in the campaign of 1812, was present at the battle of Leipzig in 1813, and participated in the conflicts under the walls of Paris. In 1826 he gained a great victory over the Persians under Abbas Mirza at Yelizavetpol and in the following year conquered Persian Armenia and captured Erivan. He obtained for Russia the advantageous Peace of Turkmantchai (1828). For these services he was created Count of Erivan. In 1828 and 1829 he made two campaigns against the Turks in Asia, taking Kars, Erzerum, and other important places. In 1831 Paskevitch, now a field-marshal, succeeded Diebitsch as commander of the Russian forces in Poland; he put an end to the revolt within three months after his appointment, taking Warsaw after a desperate resistance, September 8, 1831. He was made Governor-General of Poland, and such was the vigor and severity of his rule that the eventful year of 1848 passed without any attempt at revolution. When Russian intervention in Hungary had been resolved upon in 1849, Paskevitch marched into that country at the head of 200,000 men. The Hungarian main army, unable to make head against the double foe, laid down its arms at Világos, August 13th. In 1854 Paskevitch took the command of the Russian army on the Danube; but after an unsuccessful siege of Silistria he resigned his command and retired to Warsaw, where he died, February 13, 1856.

PASMA (Neo-Lat., from Gk. *πάσμα*, a sprinkling, from *πάσσειν*, *passein*, to sprinkle). A non-officinal healing powder, which is regarded as very serviceable in burns, ulcers, excoriations, etc. It is composed of 30 parts of silica, 12 of magnesia, 6 of alumina, 2 of protoxide of iron, and 50 of starch from the olgra root. The name is also applied to a paste or salve, or to a poultice.

PAS'PALUM (Neo-Lat., from Gk. *πάσπαλος*, *paspalos*, sort of millet, from *πᾶς*, *pas*, all + *πάλη*, *palē*, meal). A genus of numerous species of grasses, natives of warm climates, with solitary or variously grouped spikes, one-flowered spikelets, and awnless palea. *Paspalum scrobiculatum*, the cereal koda, cultivated in India, grows in dry loose soils. *Paspalum exile* is called fundi (see FUNDI) or fundungi in West Africa, where it is similarly cultivated. *Paspalum racemosum* is a very important fodder-grass in the coast districts of Peru during the dry months of February and March. It has been introduced into France; but it is apt to be injured by frosts, and seldom ripens its seeds in the neighborhood of Paris. Several perennial species are indigenous in the Southern United States, where they are highly appreciated as fodder and pasture grass. They have some of the characteristics of Bermuda grass (q.v.). *Paspalum compressum* (or *Paspalum platicaule* of some botanists), commonly known as Louisiana grass, is considered an excellent lawn grass for the Southern States, being superior to Bermuda and less difficult to eradicate.

PASPATIS, pȧs-pä'tĭs, ALEXANDROS GEORGIOS (1814-91). A modern Greek historian, born on the island of Scio. He was enslaved in 1822, but was manumitted in Smyrna, came to the United States, and graduated at Amherst in 1831. He studied medicine at Paris and Pisa, and, after many years' practice in Constantinople, became professor in the University of Athens in 1878. He wrote: *Etudes sur les Tchinghianés ou Bohémiens de l'empire ottoman* (1870); *The English Version of the Revised New Testament* (1882); *The Great Palace of Constantinople* (trans. from the Greek by Metcalfe, 1893); and various works in Greek, of which the most important is on the capture of Constantinople by the Turks in 1453 (1890).

PASQUE-FLOWER (OF. *pasque*, Fr. *pâque*, Easter, from Lat. *pascha*, Gk. *πάσχα*, Easter, from Heb. *pesach*, a passing over, Passover, from *pāsach*, to pass over), *Anemone*. A genus of perennial silky herbs of the natural order Ranunculaceæ, by some botanists separated into the genus Pulsatilla, the chief distinguishing characteristic being the long feathery awns of the fruit. The common pasque-flower (*Anemone Pulsatilla*) is a native of Europe, with widely bell-shaped bluish-purple flowers, the petals of which are often used to color Easter eggs. *Anemone pratensis* has smaller and more perfectly bell-shaped blackish-purple flowers. These plants emit, when bruised, a pungent smell, due to an essential oil. *Anemone patens* is acrid and is said to blister the skin occasionally. *Anemone patens Nuttalliana*, the American pasque-flower, occurs abundantly from Illinois northward and westward.

PASQUE-FLOWER (*Anemone Pulsatilla*).

PASQUIER, pȧ'skyā', ETIENNE (1529-1615). A French jurist and author. He early studied law under the ablest jurists of France and Italy,

and in 1549 was called to the bar. Having already secured a considerable practice, he in 1560 published the first part of his *Recherches de la France*—an antiquarian treatise on national politics, literature, and religion. In 1565 he made his celebrated speech defending the University of Paris from the encroachments of the Jesuits. He was in 1585 appointed by Henry III. advocate-general of the Court of Accounts.

PAS'QUINADE'. See PASQUINO.

PASQUINO, pȧs-kwē'nō. The name given in Rome to a mutilated antique statue discovered in the Piazza Navona, and erected in a little square which bears the same name, near the Palazzo Braschi. From the end of the fifteenth century it was customary to affix to it epigrams on current events, frequently in the forms of questions and answers passing between Pasquino and another statue known as Marforio. These epigrams were called Pasquinades. The name is said to have been taken from a witty tailor of the early part of the sixteenth century, who was renowned for his pungent criticisms of public men. The Roman populace, when the government checked their freedom of speech, found this an outlet for their opinions; but since Marforio was transferred to the Capitoline Museum, Pasquino has not had much to say.

PASSAGE (OF., Fr. *passage*, from ML. *passaticum*, right of passage, from *passare*, to pass, to step, from Lat. *passus*, pace). In music, a term applied to a rapidly executed ornamental figure which is not essential to the melodic outline. In concertos for solo-instruments it is customary to give the performer an opportunity to display his mastery of mere technical skill. In the finale, just before the end, the composer indicates such a place by placing the word *cadenza* there. Such a cadenza has really nothing to do with the composition and consists of an extensive series of rapid ornamentations, without any accompaniment. This is called 'passage-work.'

PASSAGLIA, pȧ-sȧ'lyȧ, CARLO (1812-87). An Italian theologian. He was born near Lucca, became a Jesuit in 1827, and in 1844 was appointed professor of canon law, and later of dogmatic theology, in the Collegium Romanum. During the temporary withdrawal of the Jesuits from Rome in 1848-51, Passaglia, with some of his brethren, went to England, where he taught theology to the young brethren of his Order, and on the reëstablishment of the Jesuits in the Roman College he resumed possession of his chair. During the discussions which preceded the definition of the doctrine of the Immaculate Conception (q.v.) he published an elaborate treatise on the doctrine and history of that question (1855). Becoming interested in the movement for Italian unity in 1859, he left the Society of the Jesuits, and entered warmly into the discussions as to the temporal power of the Pope. Having fallen under suspicion in Rome, he withdrew from that city to Turin, where he established a journal entitled *Il Mediatore*, which appeared till 1866. In 1861 he was appointed by the King professor of moral philosophy, and subsequently of theology, in the University of Turin. In 1863 he became a member of the Turin Parliament. He is said to have sought reconciliation with the Church, but to have failed to make the required retractation. He died in Turin, March 12, 1887. Passaglia's [illegible] works are a treatise on the Immaculate Conception already referred to; a treatise (Latin) on the primacy of Saint Peter (1850); a scholastic treatise entitled *Commentarius Theologicus de Partitione Divini Voluntatis* (1851); an apology for the cause of Italian unity, entitled *Pro Causa Italica ad Episcopos Catholicos* (1861), in which he attacked the temporal power of the Pope and recommended the Church to make peace with the nation; several essays on religious and political subjects, and a reply to Renan's *Vie de Jesus* (1864).

PASSAIC. A river of northern New Jersey (Map: New Jersey, D 2). It rises a few miles southwest of Morristown, flows in a devious course northeastward to Paterson, then bends abruptly to the south, and flows into Newark Bay between Newark and Jersey City. It is about 100 miles long, and navigable 13 miles for small steamers and sloops. At Paterson it has a perpendicular fall of 50 feet, which furnishes immense water power.

PASSA'IC. A city in Passaic County, N. J., 11 miles northwest of New York City and 4 miles south by east of Paterson, at the head of navigation on the Passaic River, and on the Erie, the Lackawanna, and the New York, Susquehanna and Western railroads (Map: New Jersey, D 2). It has two public libraries, the Jane Watson Reid Memorial Library, completed in 1903, being the finest edifice in the city. Among other prominent features are the municipal building and the city hall and park. The city is extensively engaged in manufacturing—the industrial establishments include rubber and woolen mills, pantasote leather works, print works, chemical works, silk mills, and handkerchief and enameline factories. There are also large vineyards and a winery. Under a revised charter of 1874, the government is vested in a mayor elected every two years, a council, and in administrative officials, the majority of whom are nominated by the executive with the consent of the council. The school board is independently elected by popular vote. Population, in 1890, 13,028; in 1900, 27,777. Settled about 1679, and organized as a township in 1693, Passaic was incorporated as a village in 1869, and chartered as a city in 1873. Until about 1852 it was known as Aquackenonk Landing. In November, 1776, Washington, retreating through New Jersey, crossed the Passaic at this point. Consult Pape and Scott, *History of Passaic* (Passaic, 1899).

PASSAMAQUOD'DY (perhaps, pollock-catchers). A small Algonquian tribe, closely related to the Anaki'eite and less intimately to the Abnaki proper, and formerly residing about Passamaquoddy Bay and Saint Croix River, in Maine and New Brunswick. In customs they resembled the Abnaki, and, like them, acted with the French in the colonial wars. They are now gathered, to the number of about 200, at Pleasant Point and on Lewis Island, on the bay of their name.

PASSAMAQUODDY BAY. An inlet of the Bay of Fundy, forming part of the boundary between Maine and New Brunswick (Map: Maine, K 6). It is 12 miles long by 6 wide, and shut in by a cluster of islands so as to form an excellent harbor. It receives the Saint Croix and other rivers. The city of Eastport, Maine, lies on one

of the islands, and at the head of the bay is the town of Saint Andrews, New Brunswick. The tide here rises 25 feet.

PASSANT, pă'sănt' (Fr., passing). An heraldic term used to express the attitude of an animal in a walking position, with his head straight before him. See HERALDRY.

PASSAROWITZ, păs-să'rō-vĭts (Serv. *Pozarevac*, pō-zhă'rĕ-văts). A town of Servia, situated about 35 miles southeast of Belgrade (Map: Balkan Peninsula, C 2). It has a considerable trade in agricultural products. It is noteworthy for the treaty concluded here on July 21, 1718, between Turkey, on one side, and Austria and Venice on the other. Turkey ceded the Banat, part of Servia (including Belgrade), and parts of Bosnia and Wallachia to Austria. She retained the Morea, which had been reconquered from the Venetians in 1715. Population, in 1900, 12,957.

PASSAU, *Ger. pron.* päs'sou. An ancient town of Bavaria, Germany, situated at the confluence of the Danube, the Inn, and the Ilz, on the Austrian frontier and about 90 miles northeast of Munich (Map: Germany, E 4). The town proper is situated on the rocky tongue between the Danube and the Inn, and is remarkably picturesque with its old-fashioned houses rising in terraces above each other. The two suburbs of Innstadt and Ilzstadt are situated on the Inn and the Ilz respectively. Opposite Ilzstadt stands the old fortress of Oberhaus, dating from the beginning of the thirteenth century. The centre of the old town is the Domplatz, with its beautiful cathedral founded in the fifth century and rebuilt in the rococo style in the seventeenth century. Adjoining the cathedral is the post office, formerly the canons' residence, where the Treaty of Passau (q.v.) was concluded in 1552. Worthy of mention are also the old and the new rococo episcopal residences and the recently restored Rathaus. In the Innstadt is situated the pilgrimage church of Mariahilf. The educational institutions include a gymnasium founded in 1611, a *Realschule*, a school of agriculture, a training school for teachers, and a number of institutes for girls. The city manufactures hard-wood flooring, leather, paper, mirrors, porcelain, matches, wire, etc., and trades in wood, salt, and grain. Population, in 1890, 16,333; in 1900, 17,988, chiefly Roman Catholics.

Passau proper occupies the site of the Castra Batava of the Romans, and Innstadt is identified with the Celtic settlement of Boiodurum, founded about one hundred years B.C. The bishopric of Passau, of which the town is the seat, was founded in 738, secularized in 1803, and re-established in 1817. Consult Moun, *Passau* (Passau, 1878).

PASSAU, TREATY OF. An agreement made in the year 1552 at Passau, by the Elector Maurice of Saxony and Ferdinand, King of the Romans, representing his brother, the Emperor Charles V. It was signed by Maurice on August 2d and agreed to by the Emperor a few weeks later. It established peace between the Catholics and Lutherans pending the settlement of ecclesiastical matters by the next Diet, thus guaranteeing the free exercise of their religion to the adherents of the Confession of Augsburg in the States which had adopted this form of worship. A definitive settlement was effected at the Diet of Augsburg in 1555. Consult Barge, *Die Verhandlungen zu Linz und Passau und der Vertrag von Passau* (Strassburg, 1893). See REFORMATION, THE PROTESTANT.

PASSAVANT, pă'sà'vänt', JOHANN DAVID (1787-1861). A German art critic and painter, born at Frankfort-on-the-Main. He studied painting with David and Gros at Paris, and afterwards with the Nazarites in Rome. His paintings are unimportant, but he eventually became inspector of the Städel Institute at Frankfort, and did much to promote art, by virtue of his position, and also by his literary works. The principal of these are: *Rafael von Urbino und sein Vater Giovanni Santi* (1839-58); *Die christliche Kunst in Spanien* (1853); and *Le peintre-graveur* (6 vols., 1860-64), an appendix to Bartsch's standard work on the same subject. Consult his autobiography (Frankfort, 1863), and the biography by Cornill (ib., 1865).

PASSAVANT, WILLIAM ALFRED (1821-94). An American philanthropist, born at Zelienople, Butler County, Pa. He graduated at Jefferson College in 1840, and at the Lutheran Theological Seminary in 1842; was ordained to the Lutheran ministry in the latter year; was pastor of churches at Baltimore, Md., and Pittsburg, Pa., successively, and subsequently became widely known as the founder of hospitals and orphan asylums at various places in the United States. In 1870 he, with A. Louis Thiel, founded Thiel College, at Greenville, Pa., and in 1819 he founded the Lutheran Theological Seminary in Chicago. He introduced the order of deaconesses into the United States. He was founder and editor of *The Workman*, published at Pittsburg; from 1845 to 1861 edited *The Missionary*, and subsequently was a co-editor of *The Lutheran*, into which *The Missionary* was merged in 1861.

PASS CHRISTIAN. A town in Harrison County, Miss., 58 miles east by north of New Orleans, on Mississippi Sound (Gulf of Mexico), and on the Louisville and Nashville Railroad (Map: Mississippi, G 10). It is one of the most popular watering places on the Gulf, having a healthful climate and excellent facilities for boating, bathing, and fishing. Among its attractions is a wide shell-paved avenue, lined with fine trees. It extends for seven miles along the shore, where there are many pleasure piers. Pass Christian is the centre of an important oyster industry; it also has a large packing establishment. Population, in 1890, 1705; in 1900, 2028.

PASSÉ, pă'sā'. A tribe of the great Arawakan stock (q.v.), formerly the most numerous tribe on the Japura River, Northwestern Brazil, but now nearly extinct. Both men and women are noted for their light complexion, fine figures, and handsome features, approaching the Caucasian type. They are clean in habit, intelligent, gentle, and industrious, and have been called the noblest tribe of the Amazon region. They tattoo their faces; the men cut the hair close, while the women wear it flowing loosely. They bury their dead in circular graves and are greatly under the influence of their priests.

PASSENGER PIGEON. The American wild or migratory pigeon. See PIGEON. Also Plate of PIGEONS.

PASSENGERS. See CARRIER, COMMON.

PASSEPIED, pās'pyā' (from Fr. *passer*, to pass, from Lat. *passus*, step, from *pandere*, to stretch + *pied*, foot, from Lat. *pes*, foot). An old French dance in three-eighth or six-eighth time. It resembled the minuet, but was a little more lively. During the time of Louis XIV. it was introduced into the ballet, and was also often inserted in suites. It was divided into a number of parts of eight or sixteen bars each.

PASSERAT, pās'rä', JEAN (1534-1602). A French poet and scholar, born at Troyes. He taught in various Provençal colleges until 1599, when he gained the patronage of Henri de Mesmes, and settled in Paris. In 1572 he succeeded Ramus as professor of eloquence and Latin poetry at the Collège de France, where his learning and wit brought him many pupils. But Passerat was a patriot, and during the Wars of the League he had to suspend his courses. At this time he was one of the authors of the *Satyre Ménippée* (1594), which was his chief literary achievement. The grace, point, and erudition of his verse make him one of the most interesting of the post-Pléiades. His works include: *Vers de chasse et d'amour* (1597); *Kalendæ Januariæ et Varia quædam Poemata* (1597), and commentaries on Tibullus, Catullus, and other Roman poets. His collected works were edited by Blanchemain in 1881 (Paris).

PASSERES, pā-sē'rēz (Lat., sparrows), or PASSERIFORMES. The largest order of birds, nearly corresponding to the old order Insessores or 'perchers.' The order takes its name from a typical genus (Passer) represented by the common house-sparrow (q.v.). The Passeres are characterized by the possession of four toes, three in front and one behind, all inserted on the same level. The muscle that bends the hind toe is separate from the muscle which bends the other toes collectively; there is no ambiens, and no accessory femoro-caudal muscle; the sternum has a single notch on each side behind; there are more than six secondaries and the rectrices are almost always twelve; the palate is egithognathous; there is a single carotid, the left; the oil-gland is nude; there are two cæca; the upper cervical feather-tract is directly continuous with the dorsal tract, and the femoral tracts are weak; the young are hatched naked and helpless. More than half of all known birds are Passeres. They are found everywhere, and their habits, colors, food, songs, eggs, etc., show the greatest diversity. According to the structure of the syrinx, they are grouped as Clamatores (Passeres anisomyodæ), or as Oscines (Passeres diacromyodæ). Consult Evans, *Birds* (London, 1900).

PASSI, pās'sē. A town of Panay, Philippines, in the Province of Iloilo, situated 19 miles north of Iloilo (Map: Philippine Islands, C 5). Population, 13,802.

PASSING NOTES. A term in music. In passing from one chord to another, an intervening note, not belonging to either chord, may be used to assist the progression. Such a note is called a passing note or note of transition, as the notes marked * in the upper part of the subjoined example:

They differ from suspensions in not being prepared and in always entering upon the unaccented beat.

PASSINI, pās-sē'nē, LUDWIG (1832-1903). An Austrian painter, born in Vienna. He was a son and was first instructed by the engraver Johann Passini (1798-1874), then studied at the Vienna Academy under Führich and Kupelwieser, and finally devoted himself to painting in water-colors under Karl Werner, with whom he traveled in Italy. In 1855 he made his home in Rome, where he first painted architectural subjects and interiors with figures, but gradually cultivated more exclusively genre scenes from Italian popular life. He settled in Venice in 1876, and thenceforth devoted his lavish industry to those delineations of Venetian life with which his name is associated as one of the most distinguished aquarellists of his day. Prominent examples of his work are: "Canons in St. Peter's, Rome" (1870, National Gallery, Berlin); "Reading Aloud from Tasso to Fishermen at Chioggia" (1872); "Pompeian Vendors in Venice" (1876, Vienna Museum); "Curious People on a Bridge" (1885, Breslau Museum); "Venetian Women at a Fountain" (1890). He also painted excellent portraits.

PASSION, or PASSION MUSIC. From the earliest times it was customary in the Church to chant the story of the passion of Christ during Holy Week. As a musical art form the passion first appears in Germany about 1570. At the same time Italy originated the form of the oratorio, and for the next half century no marked distinction appears between the two forms. Then the passion began to assume characteristic traits which distinguish it from the oratorio. These traits are the frequent introduction of chorales, the retention of the character of the 'narrator' (which entirely disappeared from the oratorio), and the use of the chorus for contemplation and reflection upon the events related. See ORATORIO; SACRED MUSIC.

PASSIONATE PILGRIM, THE. A small collection of sonnets and lyrics by Shakespeare, Marlowe, Barnfield, and Raleigh, published by W. Jaggard in 1599. Shakespeare's name appeared on the title page, but was evidently unauthorized, as it was dropped in later editions, and several of the poems were erroneously attributed to him.

PASSION CROSS (Lat. *passio*, suffering, from *pati*, to suffer). A cross supposed to reproduce the form and proportions of that on which Christ suffered, with a long upright and one or two short transverses near the top. It often bears the figure of Christ, and is heavier in proportions than the resurrection cross, which also belongs to the type of the Latin cross. A passion cross, when elevated on three steps or degrees (said by heralds to represent the virtues of faith, hope, and charity), is called a cross Calvary.

PASSION-FLOWER (*Passiflora*). A genus of forty-odd species of mostly climbing plants of the natural order Passifloraceæ. The species, which are almost exclusively natives of the warmer parts of America, have alternate, simple, variously lobed leaves, from the axils of which the peduncles are produced. The flowers are usually regular, with a generally fine segmented

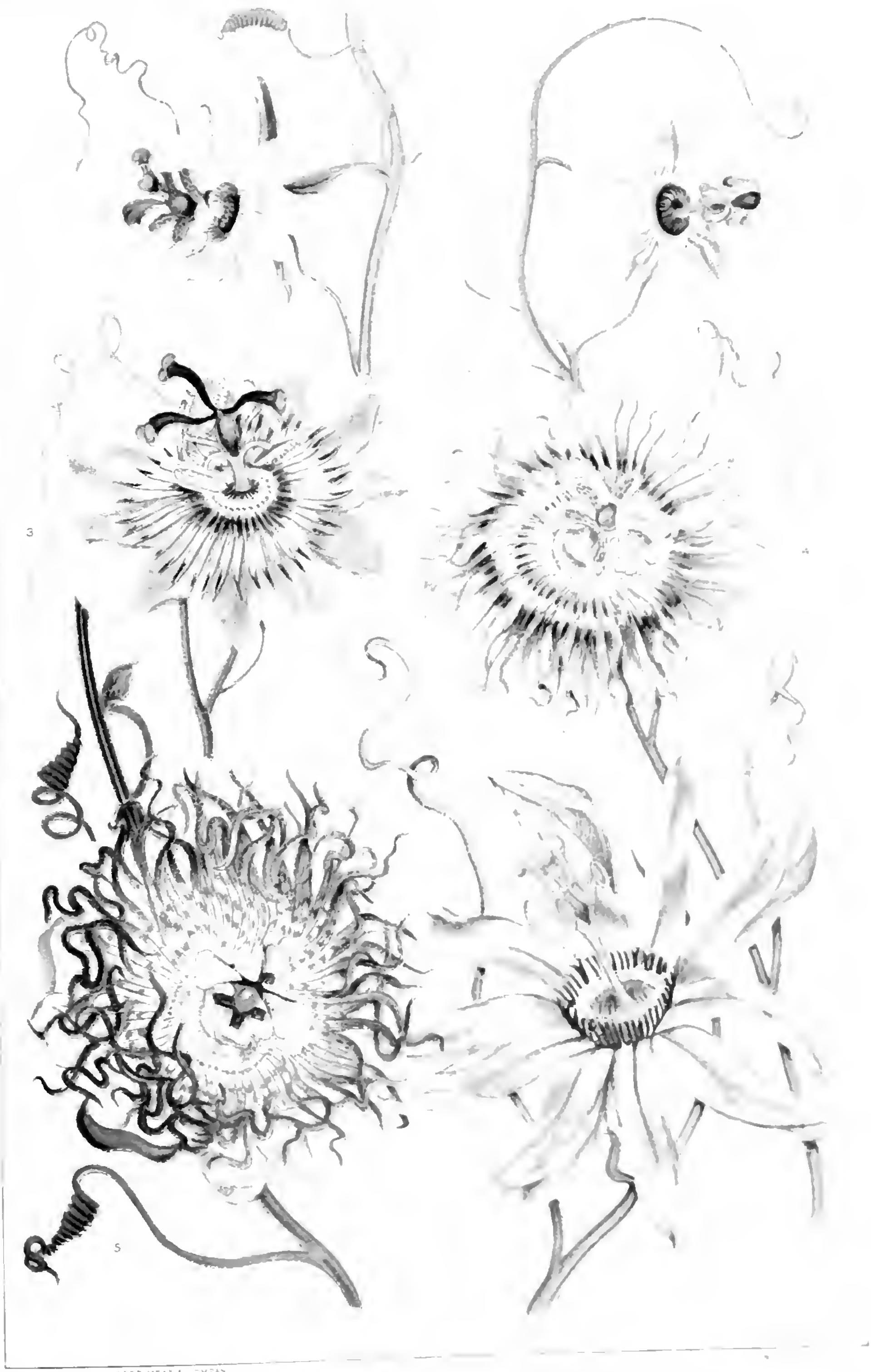
colored calyx, and similarly segmented or absent corolla. Several rows of filamentous processes spring from within the cup, which is formed by the consolidated calyx and corolla. The genus received its name from fanciful persons among the first Spanish settlers in America who imagined a representation of the Lord's passion, the filamentous processes being taken to represent the crown of thorns, the three styles the nails of the cross, and the five anthers the marks of the wounds. On account of the large and beautiful flowers, many of the species are cultivated in greenhouses; some are also grown in tropical countries for their fruit, particularly *Passiflora edulis*, or granadilla (q.v.). *Passiflora quadrangularis* is a larger edible species known as the large granadilla. One of the best known species is *Passiflora cærulea*, a native of Peru and Brazil, extensively grown for its beautiful white, pale blue, or rose-colored flowers. Like most species, it succeeds in the open only in tropical and subtropical climates. Among the popular cultivated species are *Passiflora gracilis* and *Passiflora racemosa*. About ten species are natives of the United States, among which are *Passiflora incarnata*, the May-pop of the Southern States, a showy flowered edible fruited species. The passion-flower is propagated by seeds and by cuttings of the young wood.

PASSIONISTS. The name generally applied to the order formally known as "Barefooted Clerks of the Holy Cross and Passion of Our Lord," founded by Saint Paul of the Cross (q.v.). Their first permanent settlement was made on Monte Argentaro, near Genoa, in 1737; they received the first Papal approbation as a society of mission preachers from Benedict XIV. in 1741, and their rule, modified in some points, was again confirmed by Clement XIV. in 1769, who four years later gave them the Church of Saints John and Paul on the Celian Hill in Rome, now the headquarters of the Order. The members take, besides the usual monastic vows, a fourth to remember and meditate continually upon the sufferings of Christ. Their work is principally the conversion of sinners, especially by preaching missions. Their habit is black, with a white heart-shaped piece of stuff sewed on the left breast, in which are represented the instruments of the passion—cross, nails, crown of thorns, etc. The general (*præpositus*) is elected by the general chapter for six years; each house has a rector, chosen for three years. The Order has now eight provinces—four in Italy, one in England, one in America, one in France, and one in Spain. In 1901 they numbered eighty-seven professed fathers in the United States (to which they came in 1852), with ten monasteries.

PASSION PLAY. A performance which takes place every tenth year in the village of Oberammergau, in the Bavarian highlands. In 1633, as an act of gratitude for the cessation of a plague which had desolated the surrounding country, the villagers vowed to represent the passion of Christ every ten years, and have ever since observed their vow. The inhabitants of this secluded spot, long noted for their skill in carving wood and ivory, have a rare union of artistic cultivation with perfect simplicity. The personator of Christ considers his part an act of religious devotion; he and the other principal performers are said to be selected for their holy life, and consecrated to their work with prayer. The players, about six hundred in number, are all villagers, who, though they have no artistic instruction except from the parish priest, act their parts with much dramatic power and a delicate appreciation of character. The Gospel narrative is closely followed; the acts alternate with tableaux from the Old Testament and choral odes. Many thousands of the peasantry are attracted by the spectacle from all parts of the Tyrol and Bavaria, among whom the same earnest and devout demeanor prevails as among the performers. Consult: Stead, *The Passion Play* (London, 1890); Grein, *Das Oberammergauer Passionspiel* (Leipzig, 1880). See MYSTERY.

PASSOVER (translation of Heb. *pesach*, a passing over, from *pāsach*, to pass over). The first of the three chief festivals prescribed by the Pentateuchal codes (Ex. xii.; Lev. xxiii. 4-8; Num. ix. 1-14; xxviii. 16-25; Deut. xvi. 1-8). Its celebration begins on the evening of the fourteenth day of Nisan (corresponding to the older Abib) and lasts for eight days. The Jewish Church associates the festival with the Exodus from Egypt, and this historical character was so impressed upon it as to obscure its original significance. By a careful study, however, of the passages referring to the Passover in the various Pentateuchal codes, modern scholars claim that they have traced the gradual development of the festival and have shown that it was a mixture of various elements, originally having nothing to do one with the other. In the first place, distinction must be made between two festivals combined in the Passover, viz. (1) a feast of unleavened bread known as *massōth*, and (2) a festival in which the chief rite was the sacrifice of a sheep within the family circle and the sprinkling of the lintels and doorposts of the houses with the blood. This sacrifice was called *pesach*. Of these two festivals the former is the old Canaanitish harvest festival, commemorative of the first ripening of the corn, which the Hebrews naturally adopted when they took possession of the Canaanitish soil. Thanksgiving offerings were made on this occasion to Yahweh as the 'Baal,' to whom the land belonged. Since the presentation of such gifts, consisting of the first-fruit sheaf, involved a visit to a Yahweh sanctuary, the occasion became a *khāg*—the ancient Semitic designation for a mirthful festival with dances and processions at a sanctuary and a sacrificial meal as the symbol of communion between the god and his worshipers. It was customary at this festival to eat only unleavened bread, which merely represents the usual food during the harvest season, when the people, busy with field labors, did not take time to wait in baking their bread until the completion of the slow process involved in the leavening of the dough; hence the festival became known as the *khāg ham-massōth*, i.e. the festival of unleavened bread. On the other hand, the sacrifice of the *pesach* stands in no connection with agriculture and is originally a rite of propitiation or lustration observed during a pestilence or on some other special occasion. It consisted in sprinkling with blood the entrance to the house (or tent), which was particularly sacred. It is still customary among the Bedouins to sprinkle their camels and flocks with blood as a protection against the ravages of a pestilence. This blood

PASSION-FLOWERS



1 PURPLE-FRUITED PASSION-FLOWER - [illegible]
2 SLENDER PASSION-FLOWER - PASSIFLORA GRAC[illegible]
3 COMMON PASSION-FLOWER - PASSIFLORA CÆRULEA
4 [illegible] FLORA INCARNATA
5 [illegible] PASSIFLORA QUADRANG[illegible]
6 [illegible] PASSION-FLOWER [illegible]

rite, from being indulged in on extraordinary occasions, became a regular custom observed in the spring, the bearing time of the flocks, when it became especially important to secure the protection of the deity. Already in the earliest of the Pentateuchal codes these two festivals, one belonging to the agricultural stage, the other a survival of the nomadic stage, are brought into connection with the Exodus from Egypt, and combined with each other. The combination once made, there resulted a series of ceremonial observances which gradually assumed the elaborate character of the Jewish Passover festival. The sprinkling of the blood became the symbol of the protection granted the Hebrews by Yahweh at the time that pestilence struck the Egyptian households. The offerings of the first-fruits of the field to Yahweh led to the view that firstlings of the flock and the first-born of the household likewise belonged to the deity. The sacrificial lamb and the unleavened bread were also brought into connection with the Exodus, the former pictured as a ceremony indulged in on the eve of the departure of the people, the latter a symbol of the 'haste' with which the deliverance was brought about, so that the people did not have time to bake bread from leavened dough. In later Judaism the historical association was still further emphasized, and there grew up an elaborate service for the eve of the Passover, known as the *sēder*, the chief features of which were the recalling of the Exodus by reciting the narrative in the household, the preparation of dishes symbolizing the affliction and hardships of the people in Egypt, together with thanksgivings and songs of praise accompanied by benedictions over wine for the miraculous deliverance. For eight days unleavened cakes are eaten and no food prepared of any leaven material is to be eaten. In fact, all traces of leaven are to be removed out of the house, and in orthodox Jewish households separate sets of dishes are used during the eight days of the Passover. In the Christian Church the paschal lamb became preeminently the type of the sacrifice of Christ.

Bibliography. Consult the Hebrew archæologies of Nowack and Benzinger, and the commentaries on Exodus by Dillmann, Strack, Baentsch; R. Schäfer, *Das Passah Mazzot Fest nach seinem Ursprung und seiner Entwickelung* (Gütersloh, 1900); Trumbull, *The Threshold Covenant* (New York, 1896); and for the later Jewish customs, Schröder, *Satzungen und Gebräuche des talmudisch-rabbinischen Judenthums* (Bremen, 1851); Dembitz, *The Jewish Services in Synagogue and Home* (Philadelphia, 1898).

PASSOW, päs'sō, Franz (1786–1833). A German philologist. He was born at Ludwigslust, studied at Leipzig, and was called in 1807 to the chair of Greek in the Weimar Gymnasium, and in 1815 to that of ancient literature in the University of Breslau. His principal work is his *Handwörterbuch der griechischen Sprache* (1819–24). He also published *Grundzüge der griechischen und römischen Litteratur- und Kunstgeschichte* (2d ed., 1829), and other volumes.

PASSPORT (Fr. *passe-port*, from *passer*, to pass + *port*, Lat. *portus*, port, harbor). A written instrument issued by the authority of a government for the identification and protection of its citizens when traveling abroad. It is first a certificate of the citizenship of the bearer, and, second, a formal permit authorizing him to leave the State of which he is a subject. The origin of the practice of granting passports grew out of the right of nations, which was formerly more frequently exercised than now, to withhold from foreigners the right of transit through their territory. The formal permission granted to a foreigner by a government to pass through its territory was a passport. To avoid the inconvenience of this requirement, the practice was adopted by which a subject of one government leaving his country for travel in another obtained from his government a certificate of citizenship which was accepted by the other government as a passport. This is presented to the foreign government as an identification of the bearer, who, instead of receiving a passport from the foreign government, is given permission to pass through by the act of an officer in putting a *visé* upon the certificate itself. At present Russia, Turkey, Portugal, and Greece are the only European countries where travelers cannot travel freely without passports, though some of the German States require certification for the purpose of police protection, where parties desire to reside for a considerable period in one place. In the United States passports are issued only by the Department of State and only to citizens upon application supported by proof of citizenship. No distinction is made between native-born and naturalized citizens in the granting of passports. The fee is $1, and a passport for the head of a family includes the wife and minor children. In foreign countries they may be obtained by citizens of the United States only by the chief diplomatic representative or by the consul general, or, in the absence of both of those officers, by a consul. A fee of $5 is allowed to be charged for each passport granted to a citizen of the United States abroad by a diplomatic representative. An application to a diplomatic officer for a passport by a native citizen must be accompanied by a written declaration under oath stating the name, age, and place of birth of the applicant, supported if possible by the affidavit of a creditable person to whom the applicant is personally known. If the applicant claims to be a naturalized citizen, he must produce a copy of the decree of the court by which he was naturalized. In both cases an oath of allegiance is required for transmission to the Department of State. Every such passport to be valid must be renewed either at the Department of State or at a legation of the United States abroad at the expiration of two years from its date. Passports are not granted to aliens who have declared their intention to become citizens of the United States, although they may obtain authenticated certificates of their declaration (intention which entitle them to a qualified protection while traveling abroad. Nor are they granted to naturalized citizens who have returned from long residence abroad and, under circumstances to have abandoned their nationality. The chief value of a passport is that it provides the holder with authentic proof of his national character and frees him from inconveniences which he might otherwise experience while traveling in foreign lands. It is only issued it is prima facie evidence of citizenship and as such must be respected not only by the administrative officers but by the courts of the government which [illegible] to which it may be sojourning; but it furnishes [illegible]

exemption from the jurisdiction of the country in which he may be. It is nothing more than a request to foreign governments to admit the bearer to the enjoyment of the rights and privileges to which he as citizen of the country issuing the passport may be entitled by treaty or convention.

In some European States no subject is allowed to depart therefrom without first securing a passport from his government authorizing him to leave the country. Where this rule prevails the passport is required to be countersigned by the minister or consul of the country which the bearer visits. In time of war passports or safe conducts are frequently granted by military commanders to allow persons to pass through the lines or to insure the safety of officers while in the performance of some duty which takes them beyond the lines. They may also be granted for the passage of goods as well as for individuals. Diplomatic representatives upon departing from a State in which they have been residing usually demand and receive passports to enable them to withdraw in safety.

PASSY, pȧ'sē'. A western suburb of Paris, included in the city since 1860.

PASTA, pȧ'stȧ (née NEGRI), GIUDITTA (JUDITH) (1798-1865). An Italian singer, and one of the most distinguished opera sopranos of modern times. She was born near Milan, and received her musical education partly at Como, under the chapelmaster of the cathedral there, and partly in the conservatory at Milan. After 1811 she appeared at various theatres of the second rank in Northern Italy. Her first great triumph was achieved at Verona in 1821. The year following she was engaged at the Paris Italian Opera, where her singing excited great admiration. From 1825 to 1830 was the period of her greatest triumphs, which were won principally in London and Paris. Vienna, where she accepted an engagement in 1832, witnessed the last. Some time afterwards she withdrew from the stage and purchased a villa on the banks of Lake Como, where, and at Milan, she resided. She had a magnificent voice, which easily passed from clear, shrill soprano notes to the gravest contralto tones, besides which she had great dramatic energy, and a stateliness of manner that suited lofty and imposing characters. Her principal rôles were in *Medea*, *Desdemona*, *Semiramide*, *La Sonnambula*, and *Norma* (these operas were written for her by Bellini), and Giulia in *Romeo e Giulia*. Donizetti and Pacini also wrote operas for her.

PASTEL (Fr. *pastel*, from Lat. *pastillus*, little roll, lozenge, diminutive of *panis*, loaf, bread). Colored crayon. (See CRAYON.) Also, by abbreviation, the process of drawing in color by means of such crayon. The substance is generally sold in small cylinders. The paper used is not very smooth. The drawing is carried on exactly as with black and white drawing, with this distinction, that a color effect may be, and generally is, sought, depth of shade and gradations of light and dark being replaced by gradations in colors. One of the special difficulties with the pastel process is the perishable nature of the result. A sharp jar or blow will dislodge some of the particles of color, and a touch of a soft brush or cloth will make a great scar in the colored surface. It is possible to remedy this in part by the use of a fixative; but a pastel drawing remains the most easily injured of all works of art. To guard against this, it is almost universally the custom to cover such a drawing with glass; and, moreover, the drawing must not touch the glass. Properly protected, a pastel may remain beautiful for a century and a half, as is seen in the very admirable drawings in the Louvre by French masters of the eighteenth century. The special beauty of a pastel drawing is in its soft, velvety surface, giving a bloom and depth to the color harmonies hardly attainable elsewhere; but this beauty is at once marred when it is seen through the glass covering. It will be best, then, to risk the chance of injury to pastels of no special value, keeping them in closed portfolios; and, for those of great importance, to have the glass arranged to open readily.

On the whole, pastel seems more fitted for the sketching of an artist who cares for color than for any other purpose. It gives a great facility to the artist who wishes to work rapidly, and who does not wish to wait while liquid washes or semi-liquid touches are drying.

There are crayon drawings in two or three colors which date from the sixteenth century, but pastel in the usual sense hardly appears before the second quarter of the eighteenth century. Rosalba Carriera of Venice (1675-1757), the most original of all woman artists, seems to have brought pastel drawing to its full charm during her stay in France, about 1720. The chief of all pastel-draughtsmen is generally admitted to be Maurice Quentin de la Tour (in the eighteenth century), whose works are chiefly in the Louvre and in the Museum of Saint Quentin (Aisne). Jean Baptiste Greuze, in the eighteenth century, and Eugène Delacroix, in the nineteenth did admirable work in this way, and the Swede Lundberg, who died about 1780, is also famous, though his work is not much known out of Sweden.

The art underwent a sort of revival during the last quarter of the nineteenth century. In Brussels, Emile Wauters, a portraitist of real merit, and in France H. G. E. Degas, the impressionist, have used pastel with surprising originality. Other noted pastel artists of the present day are Pierre Carrier-Belleuse, René Gilbert, Emile René Ménard. In the United States this medium has been used with success by William M. Chase, J. Appleton Brown, and especially by J. Wells Champney. Consult: Robert, *Le Pastel* (Paris, 1890); Jännicke, *Kurze Anleitung zur Tempera- und Pastelltechnik* (Stuttgart, 1893); Retscher, *Anleitung zur Pastellmalerei* (4th ed., Dresden, 1900).

PASTEUR, pȧs'tẽr', LOUIS (1822-95). A celebrated French scientist, born at Dôle. He early devoted himself to the study of chemistry and took his doctor's degree in 1847. In 1848 he became professor of physical science at Dijon, and in the following year accepted the professorship of chemistry at Strassburg. In 1854 he founded the faculty of sciences at Lille, of which he became dean. Here he remained until 1857, when he went to Paris as scientific director of the Ecole Normale Supérieure and was elected a member of the Institute. In 1863 he became professor of geology, physics, and chemistry at the School of Fine Arts, and from 1867 to 1875 was

professor of chemistry at the Sorbonne. Later he carried on his researches at the institute bearing his name. The results of Pasteur's investigations have formed contributions of the highest importance to nearly every branch of physical and natural science. By his classical researches on optically active substances and their separation into isomeric modifications of identical chemical but different physical properties, Pasteur became the founder of modern stereo-chemistry (q.v.). In the province of fermentation and the germ theory his work was even more valuable. He showed that lactic, butyric, acetic, and other fermentations are caused by micro-organisms, and established on a firm scientific basis the principle that spontaneous generation cannot take place, at least under ordinary conditions. The different processes of putrefaction and fermentation set up by the air are invariably produced by germs the presence of which in the atmosphere Pasteur demonstrated by passing a current of air through guncotton, and dissolving the latter in a mixture of alcohol and ether; an insoluble residue was thus obtained, in which the germs of organisms could be readily seen with the aid of a microscope and could be shown to be capable of developing into mature organisms.

Pasteur's studies on the diseased conditions of wine and beer have rendered possible and easy the prevention of these conditions. No less important were his investigations on the silkworm's disease *pébrine* and its cure. His discovery of bacteria as the cause of anthrax (splenic fever) in cattle was epoch-making in the science of diseases. Similar results were obtained with regard to fowl-cholera; and his experiments show success in preventing the various diseases caused by septic bacteria, by inoculating animals with a milder form of the disease by means of a weaker brood of bacteria, artificially cultured. Pasteur found that by keeping a cultured crop of specific micro-organisms at a certain temperature with a full supply of oxygen, he could reduce organisms to an incapacity for producing spores, therefore to sterility. But before this point is reached the cultured organism loses its virulence, although still germinating; vaccination with it then produces a mild disease, which effectually protects from the fatal scourge of splenic fever, of fowl's cholera, and other diseases.

In the same manner he dealt with splenic apoplexy, which he showed to be caused by the presence of specific bacteria in the blood. By artificially cultivating these bacteria he succeeded in developing a weaker crop of germs; and by inoculating healthy animals with the virus he produced a milder form of the disease, which is believed to afford protection from the more violent and dangerous malady. Pasteur's well-known treatment of hydrophobia (q.v.) is based on a similiar principle.

His published works include: *Nouvelle exemple de fermentation déterminée par des animalcules infusoires pouvant vivre sans contact de l'air* (1863); *Etudes sur le vin, ses maladies, causes qui les provoquent*, etc. (1866); *Etudes sur le vinaigre, ses maladies*, ... *les moyens de les prévenir*, etc. (1868); *Etudes sur la maladie des vers à soie* (1870); *Nouvelles études sur la maladie des vers à soie*, etc. (1871); *Etudes ... la bière, ses maladies*, etc. (1876); *Les microbes* (jointly with Tyndall, 1878); *Sur les maladies ... contagieuses et en particulier sur la maladie appelée vulgairement choléra des poules* (Paris, 1880); and several important articles in the *Annales de Chimie*. Consult: Bournand, *La bienfaitrice de l'humanité: Pasteur, sa vie, son œuvre* (Paris, 1896), and a *Life* in English by Mr. and Mrs. Percy Frankland (New York, 1898).

PASTEURIZER. An apparatus for preserving by means of heat milk, milk, and other solutions from decomposition.

PASTICCIO. pä-stēt'chō (It., medley). In music, a term applied to works that are patched up from various earlier works of a composer. In the eighteenth century operatic composers did not always trouble themselves to compose new music to a new text. They took arias or choruses from their other earlier operas and adapted them to a new text. Gluck's *Paride e Elena* is such a pasticcio in which the composer used the best arias of operas previously written by him. Handel made liberal use of this inartistic device, even in some of his best works. Thus the famous chorus from the *Messiah*, "For unto us a child is born," is not original, but the music is taken note for note from a madrigal composed by Handel himself in 1712 to a text representing a jealous lover.

PASTO, pä'stō. The capital of the province of the same name in the Department of Cauca, Colombia, near the border of Ecuador, and 120 miles northeast of Quito (Map: Colombia, B 3). It is situated at an altitude of 8650 feet in the midst of a large plain at the foot of the volcano of the same name. The town is well constructed, with broad, well-paved streets, and many fine private residences. It is an episcopal seat with a seminary and collegiate institute. It has manufactures of woolen blankets, hats, and certain kinds of decorated pottery. It maintains a regular trade with Ecuador. Its population is about 10,000. Pasto was founded by order of Pizarro in 1539. It was twice burned during the wars of independence and ruined by an earthquake in 1827, in which 10,000 people perished.

PASTON LETTERS. The correspondence of the Paston family in Norfolk, England, including over 1100 letters, together with a few State papers which came into the family's possession. The letters cover the years 1422-1509 and are of the utmost value as affording us our only glimpse into the public and private life of the time in all its phases. They were first published by Sir John Fenn in five volumes (London, 1787-1823), the last volume appearing by another hand after the principal editor's death. The disappearance of the manuscripts after their publication naturally led to doubts as to their genuineness. Gairdner defended their authenticity on the grounds of internal evidence, and the soundness of his argument was completely proved by the subsequent reappearance of several volumes of the lost manuscripts. He also prepared an admirable edition of the letters in three volumes (London, 1872-75; reprinted in 1896), with an introduction containing a full history of the Paston family in connection with the history of the times. This edition was speedily exhausted and a new one by the same editor, containing 105 new letters, appeared in four volumes (London, 1900-01).

PASTOR (Lat., shepherd: so called because frequently seen near flocks of sheep). The popular, as well as the generic name of certain birds of the starling family (Sturnidæ). They differ from starlings in the compressed and slightly curved bill. In habits, as in structure and food, the groups are very similar. (See Oxpecker.) They are confined to the Old World, and especially to the Orient, though one species, the rose-colored pastor, or rose-starling (*Pastor roseus*), glossy black, with pink back and abdomen, is occasionally seen (sometimes in vast flocks) about the Mediterranean. It is not only a very handsome bird, but is very useful, especially where locusts occur, as the pastors eat the young locusts greedily, and are for this reason sometimes called 'locust-birds' (q.v.). In India the species is numerous and familiar, and is included with the mynas. See Plate of Larks and Starlings.

PASTOR, päs'tôr, Ludwig (1854—). A German historian, born at Aix-la-Chapelle. He studied at the universities of Bonn, Berlin, and Vienna, became a lecturer at Innsbruck in 1880, and was appointed to a professorship of history there in 1886. In the preparation of his historical works he made extensive research in the archives of Germany, France, and Italy, particularly those of the Vatican, first made accessible by Leo XIII. His chief publication is his *Geschichte der Päpste seit dem Ausgang des Mittelalters* (1886-95; 4th ed., 1899-1901; English trans., London, 1891-98), an extensive and thorough history of the Papacy from the close of the Middle Ages. Other volumes by him are *Die kirchlichen Reunionsbestrebungen während der Regierung Karls V.* (1879), and *Die Korrespondenz des Kardinals Contarini während seiner deutschen Legation* (1880).

PASTORAL EPISTLES. A sub-group in the collection of New Testament letters which in their several addresses claim to have been written by the Apostle Paul. They comprise the following three writings: I. Timothy, II. Timothy, and Titus. They are called *Pastoral* because of the rather unusual character of their contents, as compared with the Apostle's other letters, being addressed to helpers of the Apostle, whom he had left in pastoral care of certain fields, and whom he wished in these communications to instruct regarding the duties involved in their charges. See the articles on the individual Epistles.

PASTORAL POETRY (Lat. *pastoralis*, relating to a shepherd, from *pastor*, shepherd; connected with *pascî*, to feed, *pabulum*, food, OChurch Slav. *pasati*, to feed, Skt. *pâ*, to protect). A kind of poetry in which the incidents, thoughts, and emotions of cultivated society are presented under the disguise of rustic life. The characters are shepherds and shepherdesses, in a setting of valley and hillside, and the usual theme is love. This artificial literary *genre* flourished in antiquity and for centuries throughout Western Europe. The oldest extant forms are the idyl and the eclogue, but the pastoral motive may enter the romance and the drama.

Antiquity. The pastoral undoubtedly takes its root far back in Greek literature. According to Ælianus (*Varia Historia*, x. 18) its inventor was Stesichorus of Himera in Sicily (who died about B.C. 555); and his subject was the blindness of Daphnis, afterwards the typical love-lorn cowherd. According to the ancient grammarians, it originated in the rustic cult of Artemis at Syracuse (*Scholia* upon Theocritus). These traditions certainly point to very old folksongs now lost. The extant pastoral dates from Theocritus, who flourished about B.C. 270 at the courts of Syracuse and Alexandria. To him are attributed thirty-one idyls (little pictures of life), of which ten are strictly bucolic. Here first occur Thyrsis, Tityrus, Corydon, Damoetas, Daphnis, Lycidas, Menalcas, and Amaryllis, names since made familiar to Western Europe. Theocritus seemingly reproduces the language of the peasants, their melodies, superstitions, and custom of answering one another in verse. His idyls are short descriptive lyrics combined with little dramatic pieces, sometimes comic, like the mimes which had been popular in Sicily since Sophron (about 440 B.C.). The poet introduces himself under the name of Simichidas, and devotes an idyl to his patron Ptolemy Philadelphus of Alexandria, and another to Hiero II. of Syracuse. Theocritus was followed by two poets: Bion of Symrna, known for his beautiful *Lament for Adonis*, and Moschus, author of the still more beautiful *Dirge* for Bion. Several centuries later an unknown Greek writer told the story of *Daphnis and Chloe* in prose. The theme of the romance is artless innocence; its tone is sensuous and decadent. The pastoral poem had already been adapted to Italy by Vergil (d. 19 B.C.). However much Theocritus may have idealized his country scenes, he yet had nature before his eyes. The purely artificial pastoral began with Vergil, who took his notes not so much from nature as from Theocritus. Vergil composed ten graceful bucolics, which he called *eclogæ* (i.e. selections). Like Theocritus, he wove into them incidents from his own life. From Vergil the pastoral motive spread to Horace, Catullus, and other Roman poets, and eventually throughout Western Europe.

Italy. The pastoral of the Renaissance did not spring from Vergil alone. To it contributed the *pastourelles*, love songs with a rustic setting, which were cultivated in various countries of Southern Europe in the thirteenth century. They especially flourished in Provence, as early as the twelfth century, whence they were largely diffused. They were in no way connected with Vergil, but they seem to have had their source in folk-song. In the fourteenth century the two streams of influence—the native and the classic—united to form the modern pastoral. The Vergilian revival first took the form of allegories, in which the learned addressed Latin epistles to one another under pastoral names. Eclogues of this kind passed between Dante and Giovanni del Virgilio, professor of Latin at Bologna (about 1320). Dante figures as Tityrus and his friend as Mopsus. Petrarch (1304-74) also composed a pastoral in twelve eclogues, in which he worked out an elaborate allegory. Dante and Petrarch thus mark the reappearance of Vergil as a literary force. Boccaccio (1313-75) blends the ancient and the indigenous pastoral. He wrote Latin eclogues much in the manner of his great compatriots. His *Ameto* (1342) is the first pastoral romance in the vernacular. He took as his model the song-fable in which prose is employed for the narrative and verse for the expression of the feelings. Under the names Caleone and Fiammetta Boccaccio veiled his passion for Maria, natural daughter of King Robert of

Naples. The *Ameto*, with its disguised personal history and cross-loves, is the prototype of the later Italian pastoral romances, of which a famous specimen is the *Arcadia* (1504) by Jacopo Sannazaro. Another aspect of the pastoral, which indeed is found in Petrarch, was rendered by Mantuan (d. 1516). His rustics were made a medium for fierce satire on women, the Court, and the Church. Attention has already been called to the dramatic element in the pastoral as early as Theocritus. When the popularity of the mediæval mystery play began to wane, the pastoral drama, easily expanded from the eclogue, was one of the forms that took its place. Even in Boccaccio's *Ninfale Fiesolano* the pastoral begins to assume a dramatic turn. But the first distinctive pastoral drama is the *Orfeo* of Poliziano, a sort of opera given at Mantua in 1471. It is founded on the story of Orpheus and Eurydice. During the next century many similar pastorals were produced at the Italian courts. By far the best of them is the *Aminta* of Tasso, performed at Ferrara in 1573. Equally well known in its own time was the *Pastor Fido* of Guarini (1590).

SPAIN. In the Spanish Peninsula the native pastoral songs counted for much more than elsewhere. As early as 1300 the *pastourelle* was cultivated at the Court of Dom Diniz, King of Portugal. And in Spain proper the Christmas mystery play, performed by real shepherds, was in fact a pastoral. The way was thus prepared for Juan de la Encina (d. 1534), who, besides translating Vergil's eclogues, composed pastoral pieces for recital before audiences at the house of the Duke of Alba. To this time belong also the pastoral lyrics by Garcilaso (d. 1536), one of Spain's greatest poets. Under Italian influences, the pastoral romance made its appearance with the *Menina e Moça* (Girl and Maiden) of the Portuguese Ribeiro (d. 1550). It was followed by the more famous *Diana* (1558) of Montemayor, a Portuguese by birth who chose to write in Spanish. For Spain the pastoral sentiment received its most refined expression in Cervantes, in his *Galatea* (1584) and the closing chapters of *Don Quixote* (1616).

FRANCE AND GERMANY. In Southern France the pastoral love song goes back to the twelfth century. At the outset this kind of poetry belonged to the country folk, who sang it especially in May, but as early as Marcabru the pastoral is already an artistic form and becomes stereotyped. A knight, happening to come where a shepherdess is, makes love to her, but he is usually dismissed. This is the theme of all. No pastorals of genuinely popular design have survived. The pastoral soon appeared in Northern France. From the beginning of the thirteenth century the French *pastorele* strongly influenced that of Provence. The shepherd Robin or Robert was adopted in the South, and Marion, too. The old theme blooms charmingly in the *Jeu de Robin et de Marion* (c. 1283) by Adam de la Halle. Though the song fable of *Aucassin et Nicolette* (c.1225) contains delightful rustic scenes, it is hardly a true pastoral. During the sixteenth century the pastoral disguise was sometimes employed by the poets. Clément Marot (d. 1544) addressed an eclogue to the King, in which he described the course of his life under the symbol of the four seasons. The pastoral ideal, enforced by translations of the Italian *Arcadia*, the Spanish *Diana*, and the Greek *Daphnis and Chloe*, culminated in the *Astrée* (1610-25) of Honoré d'Urfé, an immense prose romance. Here the bucolic lie reached its extreme idealization. The nymphs appear in gilded buskins, arms adorned with bracelets, and heads covered with garlands of pearls. From the *Astrée* the pastoral made its way into Germany, where it flourished for more than a century. Of the German pastorals may be cited the *Hercinie* of Opitz (1622), the *Daphnis* (1754) and the *Idyllen* (1756) of Gessner, the *Luise* (1795) of Voss, and Goethe's *Hermann and Dorothea* (1797), in which the idyl returned to the truthfulness and simplicity of Theocritus.

ENGLAND. Before the sixteenth century there was nothing beyond the realistic treatment of the shepherd scenes in the religious drama, and *Robene and Makyne* of Robert Henryson (d. 1506?), written in the Scotch dialect. The pastoral on the Continental model made its first English appearance in the six dull eclogues of Alexander Barclay (d. 1552). They closely resemble the work of Mantuan. In 1563 appeared eight equally dull eclogues by Barnabe Googe. To *Tottel's Miscellany* (1557) Surrey contributed two beautiful pastoral songs in the Italian manner. The important date for the English pastoral is 1579, when Edmund Spenser published the *Shepherd's Calendar*. In twelve eclogues under this title, Spenser handles the leading motives—allegory, satire, and love. During the next quarter of a century English literature became saturated with pastoral sentiment. In all the great writers lived the image of a 'golden world' somewhere in Arcadia or the Forest of Arden. The pastoral poem was cultivated in many lyrics, of which may be cited Marlowe's *Passionate Shepherd*; and in many collections, as *Britannia's Pastorals* of William Browne and the *Eclogues* of George Withers. Of romances inspired originally by Italy and Spain, the most typical is Sir Philip Sidney's *Arcadia* (1590), which had many imitators. There was, moreover, another large group of romancers, at the head of whom stood Robert Greene and Thomas Lodge, the authors respectively of *Menaphon* (1589) and *Rosalind* (1590). Undying charm was given to the pastoral ideal by Fletcher, Ben Jonson, and Shakespeare, in *The Faithful Shepherdess*, *The Sad Shepherd*, and *As You Like It*. A generation later Milton placed the masque in an exquisite pastoral setting and composed his great elegy in the manner of Moschus, Bion, and Theocritus. After Milton the English pastoral fell into sad ways. The pastorals of Pope and Ambrose Philips—each published in 1709—are utterly conventional. Their imagery, when not borrowed, is either false or so general as to convey nothing. In imitation of Philips, John Gay professed to depict rustic life with the gift of his *Shepherd's Week* (1714), which comes somewhere near country manners. William Shenstone wrote several pretty ballads, in which appear Strephon and Chloe. We come to something better in Allan Ramsay's *Gentle Shepherd* (1728), a genuine picture of Scotch rural life. Later in the eighteenth century, the pastoral was fused with other forms of descriptive poetry and hardly exists as an independent species. The pastoral elements may be woven, be uncovered. For example, the summons from the city to the country, as in

quent in Cowper, is a motive of Spenser. And the lyrics of Burns, many of them, are pastoral songs. The Vergilian type of pastoral has become thoroughly discredited. But several of the greatest English poets in the nineteenth century drew upon the Sicilian idylists. There they found truth, grace, and charm. The two finest dirges since Milton—Shelley's *Adonais* and Arnold's *Thyrsis*—go back to Bion and Moschus. Pastoral themes were beautifully rendered by Landor in some of his *Hellenics* (1847), for example "The Hamadryad." Theocritus is easily discovered in Tennyson's *Dora* and *The Miller's Daughter*.

Bibliography. Material for the history of the pastoral is scattered. Consult: Lang, *Theocritus, Bion, and Moschus*, "Golden Treasury Series" (London and New York, 1880); Gaspary, *Geschichte der italienischen Litteratur* (Berlin, 1885-88); better in the translation of Zingarelli, *Storia della letteratura italiana* (Turin, 1889-91); Warren, *History of the Novel* (New York, 1895); Dunlop, *History of Prose Fiction* (1888); Herford, *Spenser: Shepherd's Calendar* (ib., 1895); Chambers, *English Pastorals* (ib., 1896); Stedman, *Victorian Poets* (ib., 1887); Smith, "Pastoral Influence in the English Drama," in the *Publications of the Modern Language Association* (Baltimore, 1897); the authorities referred to under Provençal, French, and Spanish Literatures; and the writers mentioned in this article.

PASTORAL STAFF. See Crosier.

PASTORAL SYMPHONY, The, or Recollections of Country Life. The title of Beethoven's sixth symphony, F major, opus 68, written in the country in 1807, and produced December 22, 1808, at Vienna in the An der Wien Theatre. It belongs to Beethoven's so-called second period, and is representative of the free, joyous music which characterizes his compositions of the years 1800-15. See Beethoven.

PASTORELS (OF. *pastorel*, Fr. *pastoral*, from Lat. *pastoralis*, relating to a shepherd). A name given to certain disorderly bands which appeared in France during the thirteenth and fourteenth centuries. They were recruited from the lower orders of society, including many shepherds, whence the name. In the year 1251 a certain Jacob, who claimed to be Lord of Hungary, and is commonly known as Jacob of Hungary, appeared as their leader in Flanders. He was an unprincipled adventurer and fanatic, but an able man. The King, Louis IX. (Saint Louis), was then in the East, engaged in the disastrous Seventh Crusade, and the preceding year had been a prisoner in the hands of the Mohammedans. Jacob preached that God had rejected princes and the mighty and would free the Holy Land by means of the common people. He claimed to have special revelations and assumed ecclesiastical functions. He formed his followers in well-organized companies, and, ostensibly on the way to Palestine, they began to overrun the country. The true character of the movement soon became evident. The rulers were attacked, property was destroyed, priests and monks were murdered, and the Jews in particular suffered cruel persecution. The disorders were ultimately put down with a firm hand. Jacob was killed while haranguing a crowd in Paris, or, according to another account, in a conflict at Bourges. Seventy years later, under Philip V., similar disorders broke out under the same pretext. These bands of Pastorels ultimately threatened to attack Avignon, when the Pope, John XXII., excommunicated them, and the Seneschal of Carcassone dispersed them with an army.

PASTOR FIDO. See Guarini.

PASTO'RIUS, Francis Daniel (1651-1719). An American colonist, born at Sommerhausen, in Franconia, Germany. Having joined the Society of Friends while in England, where he met William Penn, Pastorius, in 1683, led a party of German and Dutch Mennonites to the new colony of Pennsylvania, where they founded Germantown. He was a man of noble character and deep learning, and exerted great influence among his countrymen. Five years after his arrival in America he signed a protest addressed to the Friends' yearly meeting in Burlington, N. J., which characterized slavery as unchristian. This protest is said to have been the first formal plea for emancipation made in America, and is the subject of Whittier's "Pennsylvania Pilgrim." Whittier also translated the Latin ode to posterity which Pastorius prefixed to the Germantown book of records. Among his other writings is an interesting *Geographical Description of Pennsylvania*, first published under the title, *Umstandige geographische Beschreibung der allerletzt erfundenen Provintz Pennsylvaniæ* (1700).

PASTURAGE (OF. *pasturage*, Fr. *pâturage*, from OF. *pasturer*, Fr. *pâturer*, from ML. *pasturare*, to pasture, from Lat. *pastura*, feeding, pasture, from *pavi*, to feed; connected with *pastor*, shepherd, *pabulum*, food, OChurch Slav. *pasati*, to feed, Skt. *pâ*, to protect). In law, the right of one who is not the owner of land to put his cattle and sheep on such land to feed there. In England the strips of waste land between inclosed fields and the public highways are presumed to belong to the owner of the inclosed land, subject to the right of passage in the public, and he can pasture his own cattle there, and prevent others from doing so. Pasturage is one of the rights in 'common' in many communities in Great Britain. The right is seldom separated from the ownership of the land itself in the United States. See Common, Tenancy in; Easement.

PASTURE, PASTURAGE. The word pasture signifies in its widest sense land for the grazing of domestic animals; in its limited sense, the inclosed lot or meadow found on nearly every farm in which the stock feeds on the growing herbage. The word pasturage also has two different meanings, being used in the one sense for the growing grass and other green plants eaten by stock, and in the other as a synonym for pasture. Pasture is here used in its limited sense, and pasturage as meaning the growing grass and herbage on which stock feeds. The area of the ranges, those great natural pastures of the Rocky Mountain and Great Plains regions, is decreasing as the land is being brought under cultivation by settlers. The pampas of South America, and to some extent the steppes of Asia, are vast natural feeding-grounds corresponding to our ranges. Sometimes the different kinds of farm animals are confined in one inclosure, but most farmers have a separate pasture for swine. Horses and cattle are generally pastured to-

gether, although they sometimes annoy and injure each other. Sheep graze much closer than horses and cattle, and so place the latter at a disadvantage when pastured with them, while, on the other hand, they are useful in keeping down certain weeds which horses and cattle do not eat. A dairy herd is always most profitably pastured by itself. In the United States, and in all countries where new lands are brought into cultivation, the native prairie is often used for pastures, while in older countries or long-settled regions the cultivated soil is laid down to grass for this purpose. Native grasses are hardy and adapted to the prevailing conditions of soil and climate, so that when they are used the element of uncertainty is entirely eliminated. Pasturing more stock than can be well fed in a pasture of this kind has the effect of killing out the grasses and encouraging the growth of weeds, especially during times of drought. Occasional light applications of well-rotted barnyard manure, followed by a thorough harrowing, are very beneficial when the sod has become unproductive and hard. The care of native pastures further requires that the weeds be always kept down and that hardy tame or wild grasses be sown on places where the sod is becoming bare.

The practice of laying down land to pasture is common in all farming regions, and often forms a part of the crop rotation. Pastures on cultivated land intended for only a few years are called temporary pastures, and those for a long series of years permanent pastures. In starting pastures on cultivated land the first and most important requisite is a good condition of the soil. The kinds of soil best adapted for pastures are loams and clays, while loose, sandy, and gravelly soils are entirely unsuitable in this connection. Before the land is seeded down the soil is brought to the best possible condition of cultivation and fertility, and if the natural drainage is inadequate artificial drains are laid. A high state of fertility is conducive to a luxuriant growth of grass and a rapid formation of a good sod. A heavy dressing of barnyard manure is well adapted to grass lands, because it not only furnishes all the necessary elements of plant food, but also has a beneficial effect on the mechanical condition of the soil. It is preferable to lay land down to pasture after a hoed crop like corn, which leaves the soil in a good condition of tilth and comparatively free from weeds. The methods of preparing the soil and sowing the grass seed are the same in pasture-making as in laying down land to grass for a meadow (q.v.).

The choice of grasses depends largely upon the conditions of climate and soil. On ordinary soils in regions where the rainfall is generally sufficient, Kentucky blue grass (*Poa pratensis*), Canada blue grass (*Poa compressa*), tall fescue (*Festuca elatior*), red top (*Agrostis vulgaris*), perennial rye grass (*Lolium perenne*), orchard grass (*Dactylis glomerata*), and red and white clover form a good mixture for pastures. Red top, alsike clover, creeping bent grass (*Agrostis stolonifera*), and perennial rye grass are grown in wet pastures, and red fescue (*Festuca rubra*), red top, Kentucky blue grass, and white clover in pastures on light sandy soils. In the Southern States, Bermuda grass (*Cynodon Dactylon*), carpet grass (*Paspalum platycaule*), large water grass (*Paspalum dilatatum*), and Texas blue grass (*Poa arachnifera*) are the common pasture grasses. Timothy (*Phleum pratense*), although an excellent hay grass, is often sown for pastures, but it is rather subject to injury by the trampling of stock and close grazing, and it does not form a good turf. Unlike the course [illegible] for meadows, in selecting pasture grasses those species are sought which furnish a succession of green foliage throughout the season. For temporary pastures annual and biennial and short-lived grasses are suitable, but for permanent pastures perennial and good turf-forming species are required.

Many farmers grow forage crops near their pastures to feed to the stock during times of drought, to prevent injury being done by too close cropping. The droppings of the stock are not sufficient to keep up the fertility of the soil, and hence, as mentioned above, top dressings of barnyard manure and commercial fertilizers are applied to supply the deficiency. The droppings of cattle ought to be broken up and scattered over the ground. Harrowing a pasture in the spring admits heat and light into the soil and favors the growth of grasses and leguminous plants. Weeds should never be allowed to grow in pastures, and the coarsest and rankest grass should be mowed once or twice each year. Reseeding old pastures is usually not so profitable as breaking and working up the sod and growing a few crops before the land is again seeded down. An abundance of pure water in pastures is a prime necessity. A few trees on the highest points where the stock can find cool shade are of great benefit. A paddock is a small pasture generally located near the barns. Compare MEADOW.

PAT'AGO'NIA. A name formerly applied to the whole southern portion of the South American continent, extending from the Strait of Magellan indefinitely northward to about the 38th parallel of south latitude. In its present use, though the name has no political significance, it is generally restricted to the region lying east of the Andes and south of the Río Negro (Map: Argentina, D 13). The name is supposed to be derived from the Spanish word *[illegible]*, a 'large foot,' in allusion to the large footprints found by the first explorers; but it may also come from the Quichua word *patagonia*, meaning 'terraces.' The region was visited by various Spanish and English explorers after it was first seen by Magellan in 1520. It remained unclaimed by any country until 1881, when it was incorporated into Argentina, while the strip west of the Andes was given up to Chile. The latter portion now constitutes the Chilean Territory of Magallanes (q.v.), and Patagonia proper consists of the Argentine Territories of Río Negro, Chubut, and Santa Cruz (qq.v.).

BIBLIOGRAPHY. Musters, *At Home with the Patagonians* (London, 1871); Beerbohm, *Wanderings in Patagonia* (ib., 1878); Dixie, *Across Patagonia* (ib., 1880); Milanesio, *La Patagonia* (Buenos Ayres, 1898); Carbajal, *La Patagonia* (Turin, 1899-1900); Moreno, *Explorations in Patagonia* (London, 1899); Marin Vicuña, *Al traves de la Patagonia* (Santiago, 1901); Campbell, *Through Patagonia* (London, 1901); Prichard, *Through the Heart of Patagonia* (ib., 1902). See ARGENTINA; CHILE; and for the inhabitants, TEHUELCHES.

PATAGONIAN CAVY. See CAVY.

PĀTĀLA, pä'tä'lä. In Hindu mythology, the name of a series of lower worlds, each 10,000 *yōjanas*, or miles, in depth. According to the Puranas (q.v.), they are usually seven in number: Atala, Vitala, Sutala, Rasatala, Talatala, Mahatala, and Patala. Other authorities make eight: Patala, Tala, Atala, Vitala, Tala, Vidhi-Patala, Sarkara-Bahmi, and Vijaja. These regions are entirely distinct from the Narakas (q.v.), or hells, and are inhabited by various classes of semi-divine beings. The soil is white, black, purple, yellow, sandy, stony, and golden, respectively, and they are embellished with magnificent palaces, decorated with brilliant jewels, and filled with delicious viands and wines. There are in these regions beautiful groves, and streams and lakes, where the lotus blows, and the skies are resonant with the songs of birds.

PATALIPUTRA, pä'tä-lē-pōō'trä. A famous city of ancient India, and the capital of the Kingdom of Magadha. It was situated at the junction of the Son (Sanskrit Śōna, classical Erannoboas) River with the Ganges. It seems, therefore, to have stood near the site of the modern city of Patna. It was the chief city of the Nanda and Maurya dynasties, and is famous as the residence of Megasthenes during his stay in India. It was also called Pushpapura and Kusumapura, both terms meaning 'Flower City.'

PAT'AMAR (East Indian name). A species of sailing vessel or boat used along the coast of India, especially in the vicinity of Bombay. It is of the grab (q.v.) type, is fast, and has a large carrying capacity. It was formerly much used for carrying despatches, but steam vessels have now superseded it in this work.

PATAN, pä-tän', or **PATTAN**. A town in the State of Baroda, India, 55 miles northwest of Ahmedabad (Map: India, E 3). It contains over a hundred Jain temples, and is celebrated for its collections of Jain manuscripts. It occupies the site of Anhilvada, the ancient capital of the Gujarati kingdom, renowned for its beautifully sculptured buildings, which was captured by Mahmud of Ghazni in 1024. Population, in 1901, 31,402.

PATAN. A town in Gujarat, India. See SOMNATH.

PATAÑJALI, pä-tän'jä-lē. (Probably second century B.C.) The founder of the Yoga (q.v.) system of Hindu philosophy. There seems to be little reason to doubt that he actually composed the *Yōga-sūtras* (edited and translated by Rajendralala Mitra, Calcutta, 1883), which formulate the principles of the Yoga philosophy. He is generally regarded, probably correctly, as the author of the *Mahābhāshua* (edited by Kielhorn, 3 vols., Bombay, 1878-85), a commentary on the *Vārttikas*, or Explanations, of Katyayana (q.v.), which form in their turn a commentary on the grammar of Pāṇini (q.v.). Consult: Garbe, *Sāṅkhya und Yoga* (Strassburg, 1896); Müller, *Six Systems of Indian Philosophy* (New York, 1899).

PATAP'SCO. A river of Maryland, entering Chesapeake Bay by a large and wide estuary at the head of which stands Baltimore, and which is navigable for the largest ships (Map: Maryland, M 4). The upper course of the river is very swift and furnishes considerable water power.

PATARINES, or **PATARENES**, pät'ä-rēnz. A name applied in Milan in the eleventh century to the reforming party, who held their meetings in the *Pataria* or ragmen's quarter. Under the leadership of Anselm of Lucca and the deacon Arialdo, they took energetic steps to suppress clerical concubinage and simony. They were supported by the popes, but the emperors and many of the nobility opposed them forcibly, and as a popular movement the *Pataria* died out early in the twelfth century. The name of Patarini was, however, appropriated by the Cathari (q.v.) or Manichæan heretics of Northern Italy and Southern France.

PATAS, pä-täs' (African name), **MONKEY**. One of the guenons (*Cercopithecus patas*), a native of Senegambia, distinguished from all others by its reddish color, and grayish cheeks and under parts. It is usually to be seen in menageries. See GUENON.

PATCH, SAMUEL (1807-29). An American noted for various feats of leaping. He was born in Rhode Island, went to sea in early life, and afterwards settled at Paterson, N. J., where he was a cotton-spinner. Because of his threats to jump from a bridge over the Passaic River, he was finally placed under arrest. A few months afterwards the successful performance of the feat gave him such widespread notoriety that he traveled about, leaping from the yard-arms or topmasts of ships. He lost his life in making a jump of 125 feet into the Genesee River below the falls at Rochester, N. Y.

PATCHOGUE, pă-chōg'. A village in Suffolk County, N. Y., 55 miles east of New York City, on the shore of Great South Bay, and on the Long Island Railroad (Map: New York, H 5). It is popular as a place of residence and as a summer resort, and has several hotels, fine church edifices, a high school, and a public library. The village has large oyster and fish interests, ice and cold storage plant, lumber yards, and manufactories of lace curtains, paper, and surveyor's steel tapes and supplies. It was incorporated in 1893. The government is administered by a village president, who holds office for a year, and a board of trustees, elected on a general ticket. Population, in 1900, 2926.

PATCHOU'LI (Fr., from the East Indian name). The powerfully odoriferous dried branches of Pogostemon patchouli or Pogostemon heyneanus, of the natural order Labiatæ, which first appeared in commerce in 1844. The plant is a native of the Malay coast, Ceylon, Java, the neighborhood of Bombay, and probably also of China and Japan. The odor of patchouli was known in Europe before the material itself was introduced, because of its use in keeping moths out of Cashmere shawls, hence genuine Cashmere shawls were known by their scent until the French found the secret, and imported the herb. In India, where it is known as puchapat, it is used as an ingredient in fancy tobaccos, as a perfume for the hair, and for keeping insects from linen and woolen articles. Patchouli yields by distillation a peculiar heavy brown oil, disagreeably odoriferous, which requires extreme dilution for perfumery purposes.

PÂTÉ DE FOIE GRAS, pä'tä' de fwä grä (Fr., paste of thick liver). Sometimes called 'Strassburg pie,' a dish greatly esteemed by epi-

cures, and, as the name indicates, made of the livers of abnormally and artificially fattened geese or ducks. Strassburg and Toulouse are the chief places of manufacture. The *pâtés* are exported to every part of the world, and the trade amounts to several hundred thousand dollars annually. The fowls are fed to repletion with salted maize, and by this means the liver is increased to the unnatural weight of two or even three pounds.

PATEL, pä'tĕl', Pierre (*c.*1605-76). A French landscape painter, born probably in Picardy. He is said to have been a pupil of Vouet, and also to have studied in Italy. He was one of the many painters employed on the Hotel Lambert, and on the decorations in the Louvre. His paintings are in the manner of Claude Lorraine, and he chose like subjects—the ruins of old buildings and masses of finely drawn architecture, in which he shows considerable variety in the arrangement of the surrounding landscape. He also had Claude's genius for aërial perspective and fine, glowing skies. Their works are sometimes confounded. Patel had a son who imitated his father. The Louvre contains several pictures by the older Patel; these include "Exposure of Moses," "Moses Burying the Egyptian," and some landscapes. There are other works by him in the provincial museums of Besançon, Montpellier, Nantes, and Marseilles.

PATELLA (Lat., small pan or dish, kneepan, patella), or Knee-Cap. A sesamoid bone, developed in the common tendon of the *rectus, vastus externus,* and *vastus internus* muscles—the great extensor muscles of the leg. It is of rounded, somewhat heart-shaped form, the broad end being directed upward and the apex downward. The anterior or external surface is convex, perforated by small apertures for the entrance of vessels, and marked by rough longitudinal striæ, while the posterior or internal surface is smooth and divided into two facets by a vertical ridge, which corresponds and fits into the groove on the lower articulating surface of the femur or thigh-bone, while the two facets (of which the outer is the broader and deeper) correspond to the articular surface of the two condyles.

This bone is liable both to dislocation and fracture. Dislocation is rare. It may occur either inward or outward; but it is most frequent in the outward direction. The displacement may be caused either by external violence, or by too sudden contraction of the extensor muscles in whose conjoined tendon it lies, and is most liable to occur in knock-kneed, flabby persons. It may be readily detected by the limitation of active motion, and by the bones being felt in its new position; the dislocation is usually capable of being reduced without great difficulty.

Fracture of the patella may (like dislocation) be caused either by muscular action or by external violence. Fracture by muscular action is the more common, and occurs thus: A person in danger of falling forward attempts to recover himself by throwing the body backward, and the violent action of the extensors (chiefly the *rectus*) snaps the patella across, the upper fragment being drawn up the thigh, while the lower portion is retained *in situ* by that portion of the common tendon which is continued from the patella to the tubercle of the tibia, and which is called the ligamentum patellæ. The conservative treatment consists in relaxing the opposing muscles by raising the trunk and slightly elevating the limb, which should be kept in a straight position, while straps and other devices are applied directly to the fragments to secure their close approximation. In consequence of the great difficulty of bringing the broken surfaces into exact apposition, it is very difficult to obtain bony reunion of the parts, and the case generally results either in mere ligamentous union or in no true union at all. The practical results in these cases as regards the use of the limb are fairly satisfactory, however.

The operative treatment consists in cutting down on the fragments and fastening them together with catgut, wire, or some other form of suture. It is attended with remarkably perfects results, but is not devoid of danger. A measure intermediate between operative and non-operative treatment consists in the application of hooks or other devices which seize the fragments through the skin and hold them in apposition until union has taken place.

PATELLA. See Limpet.

PATEN (Lat. *patena, patina,* flat shallow dish, from *patere,* to lie open; connected with Gk. πετανύναι, *petannynai,* to spread out). The plate on which the bread in the eucharistic service is consecrated, sometimes used also for the distribution to the faithful. In the earliest centuries it was of wood, glass, or the more ordinary metals, and underwent the same changes as the chalice (q.v.), which it accompanied. As early as the fourth century, however, patens were often made of silver or gold, weighing thirty pounds and more. These early examples were of large size and called *patenæ ministeriales* or *communicales.* The smaller patens (*patenæ parvæ*) for the use of the celebrant at the altar were of far later origin. Special patens were used for the chrism in baptism and confirmation (*patenæ chrismales*). Patens were usually circular, though later examples are sometimes polygonal or square. A very few examples remain of the Byzantine and Romanesque periods, of silver with decoration in low relief, niello, or enamel.

PATENT, and **PATENT LAW** (from Lat. *patens,* lying open, patent, pres. part. of *patere,* to lie open; originally in the phrase *littera patentes,* letter patent, open letter). A patent, in the most general sense, is a letter patent (q.v.), but the term is mostly used in the specific sense of a letter patent granted by the Government to secure to an inventor the exclusive right to make, manufacture, and sell for a certain period the thing invented or discovered by him. The term patent law is used to designate the law affecting the granting of such letters patent and their use, protection, etc. By the common law an inventor has no protection in the exclusive use of his invention, and therefore all patent law is founded upon statutes. The policy of encouraging useful discoveries and inventions in the arts and industries by securing to discoverers and inventors the exclusive benefits of their discoveries is an old one among governments. It was a common practice among the Tudor sovereigns of England to grant to inventors such exclusive privileges. At first the inventor was required to use his invention within the king[dom,

and in some instances to pay a tax to the Crown or share with it the profits derived therefrom. Until 1852 the British patent law was restricted to England, patents in Scotland being issued under the common law. In 1852 the basis of the present British system of patent legislation was laid by a comprehensive statute which was applied to the whole kingdom. The British policy of encouraging by exclusive privilege the invention of new and useful articles was extended to the English colonies in America, and we find occasional colonial statutes empowering certain persons to exercise the exclusive right to manufacture articles of use which they had invented.

The Constitution (Art. I., § 8) of the United States recognized and sanctioned the policy by conferring authority upon Congress to secure to inventors the exclusive use of their inventions for limited periods of time. In pursuance of this authority, Congress in 1790 passed an act to provide for the granting of patents to the inventor of "any useful art, manufacture, engine, machine, or device, or any improvement therein not before known or used." Applications for patents under this law were required to be made to a board consisting of the Secretary of State, the Secretary of War, and the Attorney-General. The patent was issued by this board upon the concurrent action of two members, was authenticated by affixing the great seal of the United States, and was valid for such term not exceeding fourteen years as the board might in its discretion agree upon. The law of 1790 contained provisions for the punishment of infringements and provided that no distinction should be observed between foreigners and American citizens in the granting of letters patent. A small fee amounting to less than five dollars was charged for the patent. In 1793 a new statute was passed, repealing the Act of 1790 and making several changes in the system. The new act restricted the grant of patents to citizens of the United States; required applicants to surrender to the United States any patents which they might have received from any State prior to the adoption of the Constitution; provided that applications should be made to the Secretary of State, that conflicts between applications should be decided by a board of three arbitrators, and that patents obtained by fraud or misrepresentation could be declared void by a United States district court upon due proof. Supplemental acts of 1794 and 1800 were passed, the latter of which extended patent privileges to aliens who at the time of application had resided in the United States for a period of two years. All applicants were now required to make oath that to the best of their knowledge and belief the invention for which they were seeking a patent had not been known or used in any foreign country. About this time the judicial question arose as to whether the power of Congress was exclusive in the matter of patents (Gibbon vs. Ogden, 9 Wheat. i.); but the precise point as to the right of a State to grant patents was not decided. Since then, however, the opinion has become settled that the power of Congress in the premises is exclusive.

The year 1836 marks the beginning of an era in the patent system of the United States. In that year all previous statutes were repealed and a comprehensive act was passed which brought the system somewhat into its present condition, retaining many old features, but introducing new and important changes. In the first place, it created a patent office to be attached to the Department of State, at the head of which was to be a commissioner of patents. The most important provision of the Act of 1836 was the introduction of the policy of preliminary examinations for the purpose of determining the patentability of an invention before issuing the patent. The Act of 1836 also provided for a board of appeal to hear appeals from the decisions of the examiner and commissioner against the patentability of an invention. The patent privilege was now extended to any alien who had resided one year in the United States and who had made a declaration of intention to become a citizen. The fee was fixed at $30 in the case of citizens and resident aliens, $500 for the subjects of Great Britain, and $300 for the subjects of other nations. Provision was also made for filing caveats on incompleted inventions and the policy of reissuing patents was confirmed and extended. Exclusive jurisdiction of cases involving patent rights was conferred upon the United States Circuit Courts. Provision was also made for extending the duration of patents for a period of seven years after the expiration of the original fourteen, the power of extension being placed in the hands of a board consisting of the Commissioner of Patents, the Secretary of State, and the Solicitor of the Treasury. Various amendments of the patent laws were made during the succeeding years. In 1842 provision was made for patenting designs for a period of seven years. By an Act of 1861 the term of patents for inventions was extended from fourteen to seventeen years; all former acts discriminating between aliens and citizens were repealed; a uniform scale of fees was adopted; and a board of examiners intermediate between the regular examiners and the Commissioner was established to hear appeals from the former. The whole system of patent legislation was revised and codified in 1870, and brought into its present condition.

As the laws now stand (Rev. Stat. § 4886) any person who has invented or discovered any new and useful art, machine, manufacture, or composition of matter, or any new and useful improvement thereof, not known or used by others in this country and not patented or described in any printed publication in this or any foreign country before his invention or discovery thereof, and not in public use or on sale for more than two years prior to his application, unless the same is proved to have been abandoned, may upon payment of the fee required by law obtain a patent therefor.

Patents are obtained by making application to the Commissioner of Patents in accordance with forms prescribed by law. The form prescribed is that of a petition together with an oath that the applicant believes himself to be the first inventor. The application is accompanied by a specification describing the invention in a full, clear, and concise manner. Drawings accompany the specification in cases which admit of it, and the Commissioner may require the applicant to furnish the office with a model of the article; but this of late years has not usually been required except where necessary to a correct understanding of the article. The application upon being received is referred to the proper examiner for inquiry as to whether the article possesses nov-

elty and utility and whether it has already been anticipated in the United States or abroad. If no objection is found by the examiner the patent is issued. If objection is raised by the examiner the applicant may amend his application so as to eliminate from the claims the features that are old. If still refused he may appeal to the board of examiners, and from their decision he may appeal to the Commissioner of Patents. Finally, an appeal lies to the Court of Appeals of the District of Columbia. The fee upon filing an application is $15; on issuing the patent, $20; on application for extension of a patent, $50; on granting an extension, $50. A prior patent by the inventor in a foreign country does not debar him from receiving a patent in the United States, provided the application be made within seven months of the application for the foreign patent.

Where a person has made an invention, but has not completed the details to his satisfaction, or feels that he can improve on it after further experiment, he may protect himself against a patent being granted meanwhile for the same thing, by filing a 'caveat' in the Patent Office. A caveat is a notice which contains a description of the thing claimed as an invention, and concludes with a request that the inventor's rights be protected until he has completed his invention and has an opportunity to apply for a patent. A caveat is kept secret by the Patent Office, thereby avoiding giving information which might be fraudulently utilized by clever persons, and entitles the caveator to notice of the filing of an interfering application for a period of one year. If such notice is sent him, the caveator, to retain his rights, must file his application, specifications, and, if necessary, models or samples, within three months thereafter. Where he does this his invention is considered to date back to the date of filing the caveat.

The interpretations by the courts of the various words and phrases in the sections above quoted form the great body of the substantive law of patents, in connection with the statute itself. The alternative use of the words 'invention' and 'discovery' early attracted attention, and the question arose as to whether different meanings were to be ascribed to them. It was undisputed that the mere discovery of a force of nature could not be patentable, as natural forces and elements belong to all mankind, and it was finally determined that the word 'discovery' as used was synonymous with 'invention' and involved the exercise of inventive or creative genius or faculties. For example, the person who discovered electricity as a force could not have obtained a patent allowing him the exclusive use of that force of nature, but Morse, who applied electricity to the communication of messages, was allowed a patent on his system of telegraphy, as that was a device calling for inventive genius in its creation, and was not merely the finding of an already existing thing.

Under the word 'art' many of the 'processes' now held patentable are classified. A process is a combination of the elements or laws of nature designed to accomplish a useful result. Much controversy arises over this class of patents. The word 'machine' includes all contrivances whereby mechanical parts or pieces are arranged to move together for the production of some useful result, and it is under this head that most patents are granted in the United States. The word 'manufacture' is construed to mean anything new, made by the hand of man, which is not included in the other terms employed in the above sections, and covers fabrics, furniture, clothing, etc. The term 'composition of matter' may be defined as the mixing of two or more elements or substances by chemical union or by mechanical mixing, and includes such products as paints, medicines, etc. Frequently it is very difficult to determine under which of the above heads an invention should properly be classified, but it is held not to be absolutely essential for an inventor to do so, provided it is certain that his invention comes under one or more of them. The section allowing patents for designs is liberally construed to include ornamental as well as useful designs.

Besides consisting of one of the above subject-matters, a thing for which a patent is asked must have the three general characteristics prescribed by the statute, viz.: it must be an invention; it must have novelty, that is, be new; and it must be useful. The determination of whether a thing presented really constitutes an invention is frequently a very difficult matter. In general, it may be said that it is not invention to devise something that is not a practical working device, but needs more thought or experiment to enable it to produce the result; or to construct or produce something which any mechanic or reasonably skilled person in the particular line would produce, upon request, in the exercise of his ordinary skill; or to put in better materials or workmanship into a known article; or to change the size of a thing; or to omit a useless or 'dead' part of a machine or device; or to substitute an equivalent which merely performs the same office as the part taken away, without improving the operation of the whole; or to make a new or 'double' use of a known article, without improving on it, as by utilizing the principles of an ice-cream freezer for the purpose of preserving fish. A person who produces a combination of elements, or of mechanical devices, need not be able to explain the scientific reasons for their combination or adjustment in the particular manner or form in which he presents them, in order to be considered the inventor, provided he can describe the materials and the combination or construction so that the same result may be accomplished again. See INVENTION.

A distinct and original improvement on an old invention is patentable, but a patent on the improvement does not disturb the rights of the inventor of the first device to its exclusive use as before. It is not necessary that an inventor be personally able to construct the device which he has conceived, if he can dictate his ideas to a skilled mechanic, so that the latter can readily construct the device without the exercise of his own inventive genius. However, the mere conception of a result, without being able to suggest a practical means of attaining it, is not invention.

The word 'new' in the statute is not confined to its ordinary meaning, but includes anything which has not before been made public or been given to the world. For example, if A presents a model of a machine together with an application for a patent on it, at the Patent Office, he is first entitled to a patent, although another inventor may later bring there a machine identically the same as the first, and be able to

prove that he had conceived and constructed it long before A, provided the inventor who first conceived the machine had not used it or made it public in any way. However, if the thing which is sought to be patented has been previously used in a single instance by other parties, even though that use was not known to the public at large, it is sufficient to defeat a claim for a patent on the device presented, for want of novelty, although the one presenting it and claiming to be the inventor had never heard of the previous use of his alleged invention. But a patent may be granted for a new method of producing a result theretofore accomplished in another manner, as, for instance, if a new machine should be devised for making pins.

The statute also requires that an invention, to be patentable, must be useful. This is perhaps the most liberally construed of the three general essentials, and as a result, almost anything which is not injurious to public health or morals can be patented if it contains the other essential characteristics, and contributes to the comfort, convenience, or pleasure of mankind. Thus, a toy, intended for the amusement of children, may be patented.

A patent will be issued only to the inventor, except that if he dies before making application, his personal representatives are permitted to do so, and that he may sell his rights in his invention before obtaining a patent, and in making his application ask that the patent issue to his assignee, which will be done. Joint inventors must have their inventions patented to both jointly. Foreign inventors may obtain patents in the United States, with the condition that if their inventions are not known in the United States before they make application, and a citizen of the United States has made the same invention without knowledge that it had previously been produced abroad, the latter can obtain a patent in preference to the former, even though his application be filed subsequently. Where an employee makes a new thing under the guidance and direction of his employer, the latter is entitled to the patent, as he is the actual inventor; but if an employer, independently of the suggestions of his employer, conceives and produces something which is patentable, he is entitled to the patent, as his inventive faculties were alone employed; but the employer may by the terms of his contract with the employee be entitled to an assignment of the patent. Before or after filing a caveat or application, an inventor may abandon his invention to the public by express acts or words, or by such conduct that an intention to do so may be presumed. Delay in making or completing an application and lack of public exhibition or use of the invention are considered evidence of abandonment. However, any acts or words are subject to explanation, and if the inventor was too poor to defray the expenses of an application, or was unable through temporary insanity, illness, or any other reasonable cause, to make application, the above presumption will be rebutted.

Where a patentee has reason to believe that his patent is defective by reason of an insufficient description in the specifications, or that his claims were not broad enough to include all the principles of his invention, or if there was an error affecting it in the Patent Office, he may surrender the old patent and at the same time file an application to have a new one issued to him, upon proper specifications. This is known as 'surrender and reissue.' A good patent cannot be thus surrendered for the purpose of having a new one containing the features of a subsequent improvement, issued to the inventor. The reissue must be for the same invention.

Where a claim in a patent covers more than the patentee is lawfully entitled to, the patent is wholly void. However, where this has occurred through inadvertence or mistake, the patentee may file an instrument known as a 'disclaimer,' which should contain a clear statement of what he justly claims as his own invention, and what he disclaims. Unless this is done, such a patentee cannot maintain an action to protect whatever rights he is actually entitled to in the invention. A disclaimer is not the proper method of correcting defective specifications, as it only amounts to an abandonment of a thing previously claimed.

Where two or more patents contain claims which are identical, they are known as interfering patents. In such a case, any one of the patentees may bring an action in equity to have the respective rights of the interfering patentees determined, and only one of the patents can be sustained as valid.

Patents are considered as property, and may be sold and transferred from one person to another, by assignments in writing. Provision is made for recording such assignments in the Patent Office, and unless this is done within three months after its date, an assignment will be void as against innocent purchasers or mortgagees for value. Prospective purchasers should therefore search in the Patent Office for possible assignments. Patents may be held by joint owners, partners, or corporations. An owner of a patent may convey an interest in it, or grant a license to another to use it upon payment of royalties or a fixed rent, or may grant the right to make and sell it for an agreed period.

All patented articles should be marked with the word 'patented,' and with the exact date on which the patent was granted. Unless this is done no damages can be recovered in an action for an infringement, if the infringer had no previous notice of the existence of the patent. Where an unpatented article is marked 'patented,' the person so marking it is liable to a penalty of not less than $100 and costs, to be recovered in a *qui tam* (q.v.) action, one-half of which goes to the informer, and the other half to the Government.

An infringement of a patent consists in wrongfully making, using, or otherwise dealing with a patented invention. A person to whom the patentee sells a patented machine may make necessary repairs from time to time, but they must not amount to a reconstruction of the machine, and he cannot build a new machine without being guilty of an infringement. Many cases of infringement arise in regard to patented compositions of matter, by an infringer substituting an equivalent for one element. A patentee has two remedies for an infringement. He may sue at law for damages, or may apply to a court of equity for an injunction restraining the infringer from continuing his acts, and incidentally be awarded damages for the injury suffered. If the patented article is properly stamped, it is

no defense that the infringer had not seen or heard of it.

The United States Government will not issue a patent except with the consent of the patentee, as the relation between them is in a sense contractual, as the patentee pays certain fees and complies with certain regulations in return for his protection. The grant of a patent is not the grant of a monopoly in the strict sense of that word, which is that certain rights or privileges theretofore enjoyed by the whole public are granted exclusively to one or more individuals, and the general public restrained in the exercise of those rights. A patent is merely protection for a limited time in the enjoyment of something which has been created or produced by an inventor, and which had not theretofore been enjoyed by the general public. Consult the treatises on the *Laws of Patents*, by Walker (3 ed., New York, 1895); Phillips (5th ed., Boston, 1867); Curtis (4th ed., Boston, 1873); Carpmael, *Patent Laws of the World* (2d ed., London, 1889), and the official Government reports of the United States, Great Britain, etc.; Merwin, *Patentability of Inventions* (Boston, 1883); Munn & Co., *United States Patent Law* (New York, 1870). See COPYRIGHT; LETTERS PATENT; MONOPOLY; TRADEMARK.

PATENT OFFICE. A Government department or bureau established by act of Congress in 1836, with a commissioner at its head charged with performing all duties relative to the granting of patents. In 1849 the Patent Office was transferred to the newly created Interior Department, where it has since remained. From the beginning provision was made for the collection and preservation of models, as a result of which an immense collection of specimens and designs has been gathered. In 1836 the building in which the models were kept was burned and many of them were destroyed, but Congress made an appropriation of $100,000 to procure duplicates of the most valuable ones. Again in 1877 a part of the building was burned together with many models, but the most of these were replaced by the manufacture of new ones.

The business of the Patent Office during the early years of its existence was small, the number of patents granted varying from 400 to 600 annually during the period from 1837 to 1847. In 1840 the applications for patents amounted to 735, while the number of patents actually issued was 458. In 1899 the number of applications was 35,352, while the number of patents granted was 23,550. The receipts of the Patent Office usually exceed the expenditures, although there have been exceptional years. In 1840 the receipts and expenditures were respectively $38,056 and $39,020; in 1899 they were $1,325,457 and $1,211,783. The Commissioner of Patents is required to make an annual report of the business of the office, giving with other information a list of patents issued during the year, with the names of the patentees. Specifications and drawings of all inventions are likewise published in a monthly volume. Until 1862 the Patent Office also published an annual volume on agriculture. An official gazette containing lists of patents, issued together with brief descriptions and drawings, decisions of the office on important questions arising in the course of the administration, and important judicial decisions affecting patents, is now one of the regular weekly publications of the office. The Commissioner of Patents is aided by an assistant commissioner, three examiners in chief, and a large number of examiners, each of whom has charge of a distinct class of inventions. Besides these there are several hundred assistant examiners, clerks, messengers, etc.

PATER, pā'tĕr', JEAN BAPTISTE JOSEPH (1695-1736). A French genre painter, born in Valenciennes. He was a pupil of Watteau, and painted subjects similar to those of his master. The 'fêtes galantes' were depicted by him with something of the grace and ease that distinguished Watteau himself. But although he was a good colorist, he was not a good draughtsman. His works include: "Fête Galante" (in the Dresden Gallery); "Women Bathing" (in the National Gallery, Edinburgh); "Fête Champêtre" (1728), in the Louvre; "The Bath" (in Versailles); and "The Comical March" (in the Metropolitan Museum, New York City).

PATER, pā'tĕr, WALTER HORATIO (1839-94). An English essayist, born at Shadwell, in the East of London, August 4, 1839. He was educated at King's School, Canterbury, and at Queen's College, Oxford, graduating B.A. in 1862. In 1864 he was elected fellow of Brasenose College. Except for his visits to the Continent and a short residence in London, he passed his life at Oxford. He had come to the university with the intention of entering the Church of England; but by 1865—the date of his first visit to Italy—he had lost all belief in Christian doctrines. He found his mission in interpreting to his age the spirit of the Renaissance in art and literature. For this end he employed the historical novel, the story, and mainly the essay. In all his work—much of which originally appeared in the reviews—he wrought with the greatest care, aiming at absolute precision in the expression of his thoughts and emotions. The result was an extremely delicate and refined style, delightful in its rhythm, but lacking in vigor and simplicity. After a quiet career as tutor and author, Pater died at Oxford, July 30, 1894. His publications in book form comprise: *Studies in the History of the Renaissance* (1873), containing the brilliant essay on Winckelmann; *Marius the Epicurean* (1885), a masterly exposition of the best phases of Epicureanism, put into the form of an historical romance; *Imaginary Portraits* (1887), studies in philosophic fiction; *Appreciations* (1889), containing his most subtle literary criticism and a notable essay on style; *Plato and Platonism* (1893); and *The Child in the House* (1894), an imaginary portrait. After his death appeared *Greek Studies* (1895), and a volume of essays collected from contributions to the *Guardian* (1897). His *Works* in eight volumes appeared in 1900.

PATER'CULUS, GAIUS VELLEIUS. A Roman historian, descended from an ancient and wealthy Campanian family. He is thought to have been born about B.C. 19. He entered the army at an early age, and from A.D. 4 to 12 served under Tiberius as *praefectus equitum* or *legatus* in Germany, Pannonia, and Dalmatia. He was a great favorite with Tiberius, and when the latter became Emperor, A.D. 14, Paterculus was appointed *praetor*. He was alive in A.D. 30, as his history comes down to that year; but it is conjectured

that in the following year he was perhaps put to death as one of the friends of Sejanus, of whom he speaks highly in his work. Paterculus's claim to remembrance is his *Historiæ Romanæ*, a compendium of universal, but more particularly of Roman, history, in two books. The work, as we have it, is not complete, the beginning and a portion following the eighth chapter being wanting. It seems to have commenced with the fall of Troy, and describes only the most prominent historical incidents, but these, fortunately, with considerable fullness of detail. The *editio princeps* of the *Historiæ Romanæ* appeared at Basel in 1520. Later editions are by Orelli (Leipzig, 1835); Kritz (ib., 1840); Haase (ib., 1863); and Halm (ib., 1876). There is a partial English translation by Baker (London, 1814), and a complete one in the Bohn Library (ib., 1859).

PAT'ERE'RO (corrupted from *pederero*, from Sp. *pedrero*, swivel-gun, from ML., *petraria*, stone-throwing engine, from Lat. *petra*, from Gk. πέτρα, rock). A small gun, firing a shot weighing 12 pounds or less, formerly much used as a swivel. It was mounted on the ship's rail or in the bow of a boat. (See article on GUNS, NAVAL.) The name is also applied to a small mortar for firing salutes on holidays and at festivals, especially in Roman Catholic countries.

PATER JOCHEM, pä'tĕr yō'kĕm. A Swiss patriot. See HASPINGER, JOACHIM.

PATERNO, pä-tĕr'nō. A town in the Province of Catania, Sicily, situated on the slope of Mount Etna, 11 miles northwest of Catania by rail (Map: Italy, J 10). There are some interesting remains here of the Roman period. On a height overlooking the city stands an ancient Norman tower now used as a prison. There are mineral springs, and a trade in wine, oil, and flax. Paterna is built on the site of the old Greek city of Hybla Major. Population (commune), in 1881, 17,353; in 1901, 23,453.

PATERNOSTER (Lat., Our Father). A name for the Lord's Prayer (q.v.) commonly used among Roman Catholics, from the opening words of the Latin version employed in all their services. In the rosary (q.v.) it is combined with the Hail Mary; the larger beads of the rosary are thus called paternosters, and the name was at one time applied to any beads about the same size, even when used for trimming a dress.

PATERNOSTER ROW. A noted London street, long the focus of the publishing and book trade of the city. Its name is derived from the makers of rosaries and prayer-books, who formerly made it their headquarters.

PAT'ERSON. An important manufacturing city, the county-seat of Passaic County, N. J., 16 miles northwest of New York City; on the Passaic River, the Morris Canal, and the Erie, the Lackawanna, and the New York, Susquehanna and Western railroads (Map: New Jersey, D 2). The city, with an area of about 8½ square miles, extends over a broad plain around a curve of the river. The Passaic has a perpendicular fall of 50 feet at this point, and a descent of 20 feet more to the plain, affording great water power. The streets are broad and well drained. Sixty-four miles are paved, the great proportion with macadam. The street railroad system, including 50 miles of track, extends beyond the city, connecting with important towns and cities of the vicinity. Paterson has a public library of about 37,000 volumes; two city parks—East Side and West Side parks; an imposing soldiers' monument; Paterson General Hospital and Saint Joseph's and isolation hospitals; Old Ladies' Home and Children's Nursery, and other charitable institutions. Among prominent structures are also the new city hall, court-house, post-office, and several banking buildings. The manufactures, which make this the third city of the State in importance, include silk and silk goods, locomotives, steel trusses and bridge work, engines and boilers, iron and steel, brass castings, general machinery, cotton goods, linen thread, jute, paper, malt liquors, etc. The silk mills are the most extensive in the United States, employing an army of operatives, and representing a considerable amount of capital.

The government is vested in a mayor, elected every two years; a council; and in subordinate administrative officials, appointed or elected as follows: board of education and library trustees, by the executive; park commissioners and health board, by the executive, subject to the consent of the council; and heads of city departments such as are employed in the city hall, by the council. Paterson spends annually, in maintenance and operation, about $1,175,000, the main items of expense being $295,000 for schools, $145,000 for interest on debt, $120,000 for the fire department, $115,000 for the police department, $75,000 for municipal lighting, $60,000 for charitable institutions, and $55,000 for street cleaning and sprinkling. The city's bonded debt is (1901) over $3,200,000, and the valuation of property (real and personal) is assessed at nearly $50,000,000.

Paterson was founded in 1792 by "The Society for Establishing Useful Manufactures," in which Alexander Hamilton was much interested. It was thought that the town would soon become the manufacturing metropolis of America. It was incorporated as a town in 1791, William Paterson then being Governor of the State, and was chartered as a city in 1851. The steady growth of the city is indicated in the following statistics: Population, in 1840, 7596; 1850, 11,334; 1860, 19,586; 1870, 33,579; 1880, 51,031; 1890, 78,347; 1900, 105,171. The population in 1900 included 38,800 persons of foreign birth and 1200 of negro descent.

PATERSON, JOHN (1744-1808). An American soldier, born at New Britain, Conn. He graduated at Yale in 1762; practiced law for a time in New Britain; removed to Lenox, Mass., in 1774, and was elected a member of the Massachusetts Provincial Congress. Immediately after the battle of Lexington he led a regiment of minute-men to Cambridge and helped to erect the first redoubt near Boston. He afterwards served with great gallantry in the Canada and New Jersey campaigns in the operations against Burgoyne, and became a brigadier-general (1777) and a major-general (1783). He held a command in the Massachusetts militia during Shays's Rebellion in 1786, and afterwards (1794) removed to Lisle (now Whitney's Point), N. Y., and became county judge of Broome County. He served four terms in the State Legislature, was a

member of the State Constitutional Convention in 1801, and was a member of Congress in 1803-05. From 1805 until his death (at Lisle) he devoted himself to farming. Consult Eggleston, *Life of Major-General John Paterson* (2d ed., New York, 1898).

PATERSON, Robert (1715-1801). A Scottish stonemason, born near Hawick, who is immortalized by Sir Walter Scott, as 'Old Mortality.' After his marriage he leased a quarry of his own, but being a Cameronian with the courage of his convictions, his house was burned and himself made prisoner by the Jacobites on their retreat from England with Prince Charles in 1745. Paterson began his wanderings by taking monuments into the Galloway district for the graves of the Covenanters, and from 1758 he forsook his wife and family in his enthusiasm for his self-appointed task. For more than forty years he and his old white pony were well-known figures in the vicinity of every churchyard of Southern Scotland where there were Cameronian monuments. 'Old Mortality' restored their lettering and otherwise kept them in order. He depended for his living chiefly upon Cameronian hospitality, which never failed him, had ever a melancholy mania for discoursing upon the persecutions of the hill-men, and died in poverty.

PATERSON, William (1658-1719). A British financier, born in Dumfriesshire, Scotland. When a young man he removed to England, and then went to the Bahama Islands. Returning to London, he engaged in trade, and soon acquired a considerable fortune. Paterson is chiefly famous for having been the originator of the Bank of England and for having projected the Darien scheme. His first overtures to the Government for the establishment of the bank were made in 1691, but it was not until 1694 that Parliament adopted his plan and passed the act creating for ten years the corporation called the "Governor and Company of the Bank of England." Paterson was one of the original stockholders of the bank, but in less than a year he resigned, and soon afterwards took up the more visionary Darien scheme (q.v.). Removing to Edinburgh, he succeeded in persuading the Scottish Parliament to pass the Act of 1695, which created the "Company of Scotland trading to Africa and India," under the management of which the settlement at the Isthmus of Darien was made. Paterson, who had, because of a quarrel with the directors, accompanied the expedition merely as a private individual, lost his wife by death and suffered greatly from hardships and sickness. Upon his return to England he was an active and influential advocate of the union between Scotland and England, and had a considerable share in framing the articles of the treaty relating to trade and finance. In consideration of his public services, the united Parliament of 1708 recommended that he be given an indemnity for his losses in the Darien undertaking, but this was not done until 1715, when he received £18,241. Paterson published anonymously more than twenty works on finance, colonial enterprises, legislative union, and other subjects. His *Works* have been collected by Bannister in three volumes (London, 1859). Consult also, Bannister, *Life of W. Paterson* (Edinburgh, 1858).

PATERSON, William (1745-1806). An American statesman and jurist, said to have been born at sea. He came to America when very young, graduated at the College of New Jersey (Princeton) in 1763, studied law, and was admitted to the bar in 1769. In 1776 he was a member of the Legislative Council of New Jersey, and of the State Constitutional Convention. The same year he was elected Attorney-General and served ten years. He was a delegate to the Continental Congress in 1780-81, and in 1787 to the National Constitutional Convention. Here, as a representative of the smaller States, who feared to enter a union in which population or wealth should govern representation, he proposed (June 13th) the famous 'New Jersey plan.' This provided for a single legislative house, in which each State should have one vote; an Executive Council removable by Congress, and a supreme judiciary to be elected by Congress. The National Government should have power to regulate commerce, levy import duties, and, if necessary, make requisitions for money upon the States. He was one of the first Senators from New Jersey in 1789, but resigned in 1790. From 1791 to 1793 he was Governor of the State, and the town of Paterson was named in his honor. In 1793 Washington appointed him an associate justice of the Supreme Court, on which he served until his death. A collection of his letters has been published under the title *Glimpses of Colonial Society and the Life at Princeton College, 1766-1773, by one of the class of 1763*, edited by Mills (Philadelphia, 1903).

PATERSON, William Romaine (1871—). An English novelist, better known by his pseudonym, Benjamin Swift. He was born in Glasgow, and studied a year at Lausanne. His books are: *Nancy Noon* (1896); *The Tormentor* (1897); *The Destroyer* (1898); *Siren City* (1899); *Nude Souls* (1900); and *The Game of Love* (1901). Of these the earlier were overfanciful or consistently disagreeable in matter, and in manner imitations of Meredith, but with *Siren City* he struck an original note.

PATHANS, pȧ-thänz'. One of the names of the Afghan peoples of the border-land of Hindustan and Afghanistan. The Indian Pathans have been of considerable historical importance, and the less cultured tribes have at times fought desperately against the British. Consult: Bellew, *The Races of Afghanistan* (London, 1880) and *Inquiry into the Ethnography of Afghanistan* (London, 1891); Oliver, *Across the Border, Pathan and Biloch* (London, 1890).

PATHELIN, pȧt'lăN', or Maître Pathelin. A noted French farce, composed probably at Rouen in 1465. Pathelin is a tricky lawyer, whose dishonest shifts form the staple of the action. It was worked over in modern style by Brueys and Palaprat (1706) as *L'avocat Patelin* and had great success. From their dialogue comes the familiar phrase *Revenez à vos moutons*, used there to recall Patelin to the sheep whose disappearance is under discussion. Consult Schaumburg, *Die Farce Pathelin und ihre Nachahmungen* (Oppeln, 1887).

PATHFINDER. A name given to Gen. John Charles Frémont, on account of his success in exploring the passes of the Rocky Mountains.

PATHFINDER, The. A novel by James Fenimore Cooper (1840). It is the third in the *Leatherstocking Series*, and continues the career

of Natty Bumppo under the name of the Pathfinder. The scene is about Fort Oswego and Lake Ontario during the French and Indian War of 1756, and displays the sagacity of the hero in the perils of the wilderness.

PATHOLOGICAL ANATOMY (from Gk. *πάθος, pathos,* disease + λογία, *-logia,* account, from λέγειν, *legein,* to say). The branch of anatomy which treats of organs, tissues, and cells as changed from the normal by disease. It is usually studied in connection with the causative disease; and therefore in this work the pathological changes occurring during a disease are described in the article which treats of that disease.

PATHOLOGY (from Gk. *πάθος, pathos,* disease + λογία, *-logia,* account, from λέγειν, *legein,* to say). The study of disease as a province of scientific knowledge; pathological physiology. Disease is well defined as 'the expression of the sum of abnormal cell activities' (Schmaus). Such activity disturbs the regular cell life in one of three directions: nutrition, function, or multiplication. It is evident, then, that pathology is equally with physiology a department of biology.

Many theories of disease and its causation are found in the history of medicine. Athenæus, of Attalia (A.D. 69), was the founder of the pneumatic pathology. He held that there is a certain spiritual principle, the pneuma, which reaches the heart by way of the respiration and is thence driven through the whole body. When working regularly, and mixed with warmth and moisture, it occasions health. When mixed with warmth and dryness it occasions acute diseases. When mixed with cold and moisture it produces the phlegmatic diseases. When mixed with cold and dryness it causes melancholy. He also claimed that in febrile diseases the humors of the body became corrupted or putrefied. This putridity, he asserted, was a process within the fluids by which they exhaled much water.

Galen (130-c.201) elaborated and advanced the humoral pathology of Hippocrates (c.460-357 B.C.). He selected four fluids, or humors, of the body as the primary seats of disease: blood, phlegm, yellow bile, and black bile. Health he conceived to be the due combination, or 'crasis,' of these; while illness he considered was the result of a disturbance of this condition. During favorable progress of disease, these humors underwent a change, or 'coction,' which was taken as a sign of returning health and as a preparation for the 'crisis,' when an expulsion of morbid matter occurred. The humoral pathology was long in vogue. Sylvius (1478-1535) and Boerhaave (1668-1738) championed a new pathology. They asserted that the iatro-chemical 'acridities' of the fluids played a most important rôle. They classified acid, saline, oleaginous, glutinous, alkaline, and mixed 'acridities,' which were supposed to originate in the food and to be especially active in chronic diseases. Glisson (1597-1677) advanced the theory of 'irritability,' attributing it to both solids and liquids. Life itself was considered to be 'irritability.' Hoffmann (1660-1742) originated the 'solidist pathology.' He claimed that disease was "a marked disturbance in the movements of the solids and the fluids." In these disturbances the solids are the active and the fluids are the passive agents. Excessive movement produces 'spasm' and defective movement produces 'atony.' Disease, he admitted, "might be due to alteration in the humors, and especially to a gradual thickening of the vessels, which tends at once to hinder their free circulation and to prevent the excretion of waste products." His four main sources of disease were, therefore, spasm, atony, altered humors, and deficient excretion. Barthoz (born 1734) launched the mystic and vague vitalistic pathology. He assumed the existence of a 'vital principle,' neither soul nor body. Disease he asserted to be the effort of the vital principle to resist harmful agencies, or to be due to "a morbid idea manifesting itself by alterations in sensibility, abnormal movements, or an aberration in those acts which regulate the chemical constitution of the humors."

It was reserved for Virchow in 1858 to enunciate clearly and elaborate convincingly the cellular pathology, now accepted the world over, and forming the basis of a universal view of the organs and the diseases which affect them.

The complex human organism may be reduced to very simple elements—the cells and the intercellular substance to which they give origin. All parts of all organs and tissues are composed of cells or products of cells. Blood and lymph are tissues, differing from muscular or fibrous tissues in that they have fluid intercellular substance. Cells are the conductors of vital functions, normal or abnormal. Their condition changes with age, disease, and fatigue on the one hand, and reparation and nutrition on the other.

Pathological conditions affect an organ in one of two ways: as an increase or as a decrease in vital activity. Hence such conditions may be divided into two classes: the retrogressive and the progressive disorders. It is obvious that each of these processes involves functional as well as anatomical differences and abnormalities. Between the two processes seems to stand the condition of arrest of development, due to mechanical causes or to interrupted vascular supply. If development begins, but is arrested, the condition is termed *aplasia.* If the arrest is partial, the condition is termed *hypoplasia.* If an organ is wholly undeveloped, the condition is termed *agenesia.*

The pathologist's attention is fixed largely upon the nature of anatomical changes found, and the explanation of their occurrence. These changes are termed 'lesions,' and upon more or less accurate idea of their nature and extent depend the success of measures taken for the relief of disease. Having established a conception of the lesions present, the investigator turns to their cause. The inquiry as to causation is embraced in the branch of pathology termed etiology. This department includes not only the study of vegetable organisms (bacteria) and animal organisms (such as plasmodia), and mineral toxins, and their agency in producing lesions, but also the study of reaction following the activity of the agent. This reaction depends, in some measure, upon the developmental disorder present, or the inherited dispositions of the tissues as to resistance or susceptibility. Inherited conditions are largely speculative and inferential, and this factor of etiology is of less importance in the analysis of disease. The essential feature of the whole matter is the adequate comprehension of the abnormal expression of cellular life.

There are, then, three subdivisions of pathology: etiology, or the study of causes of disease; morbid anatomy, or the study of structural changes in disease; and morbid physiology, or the study of disturbances of function, including morbid chemical action.

Pathology naturally separates into two great divisions: (1) general pathology, or the study of morbid conditions which are common to several different diseases; (2) special pathology, or the study of individual diseases. To illustrate, fever is a morbid condition which enters into a number of diseases, and therefore belongs to the realm of general pathology; while the study of the lesions of typhoid fever, an individual disease, belongs to special pathology. The study of the gross and microscopic anatomy of diseased tissues is termed pathological histology. The study of the lesions in diseases referred to the surgeon for treatment and of the lesions in postoperative conditions constitutes surgical pathology.

General Pathology. Of prime importance to the pathologist is the study of *disorders of circulation*, whether (1) *hyperæmia*, arising from excess of supply or diminished escape of supply of blood; or (2) *anæmia*, a decrease of supply of arterial blood; or (3) *hemorrhage* (see Bleeding); or (4) *ædema* (q.v.); or (5) *thrombosis* (q.v.), under which is to be considered *embolism* (q.v.), with consequent necrosis or relief by anastomosis.

Necrosis (q.v.) is a local death of tissue, due to circulatory disorder, thermic action, or inflammation. A regressive disorder of the life of cells in which there is diminished nutritive and functional derangement is *degeneration*. Ten forms occur. The degeneration may be parenchymatous (or albuminous), fatty, mucous, colloid, amyloid, hyaline, glycogenic, or hydropic, or may appear in the form of petrification or pigmentation. Some of these forms of degeneration are described in the article Bright's Disease. In some forms of degeneration products of imperfect metamorphosis accumulate within the cells. In others, necrotic cells and tissue elements or foreign material collect between the cells. In still others, there is a gradual degeneration of the cell elements and a deposition in their place of a new substance. Atrophy (q.v.), on the contrary, is essential loss of substance without deposit of pathological or foreign material. Each component part of the tissues shrinks in volume. Yet atrophy may be accompanied by deposits of various kinds, and in such cases coexists with degeneration, as in arterio-sclerosis (q.v.). Defective innervation, exhausting diseases, disuse, long-continued moderate pressure, or certain drugs may be the cause of atrophy, in different tissues, and these causes must be weighed by the physicians in determining pathological conditions in the course of treatment of a diseased person.

Among the progressive processes, or those in which the vital activity of the organism is actually increased, the most important are the reproductive. Inherent in every cell is the tendency for reproduction. Stimulus of various kinds awakens this innate tendency, which results in production of new tissue of various forms. Closely allied to the reproductive energy is the stimulus and the power to repair, to replace lost parts. Should the process of rebuilding go on to an excess of mere replacement, or should regular physiological growth be excessive, and the result be an increase in size as well as an increase in number of the elements, the condition is termed *hypertrophy* (q.v.). Under the influence of bacteria or chemical agents or unascertained causes, and accompanied by pronounced vascular disturbance, a certain progressive process results in *inflammation* (q.v.). Still another progressive process results in the formation of neoplasm, or new growths, constituted of tissues of a different kind from those adjacent and developing at their expense. Most of these formations are considered under Tumor.

With this preliminary knowledge of the processes at work, it is usual, in taking up the study of *special pathology*, to consider first the diseases of the blood, next those of the lymphatic tissues, then those of the various systems with their organs — respiratory, gastro-intestinal, urinary, and reproductive—and then the diseases of bones and of joints, of voluntary muscles, of the brain and its membranes, of the spinal cord and its membranes, and of the peripheral system of nerves.

To bacteria are ascribed the production of lesions, and they certainly influence chemical and physiological processes, locally and systemically. To their agency are ascribed pneumonia, diphtheria, cholera, leprosy, bubonic plague (qq.v.), etc. Animal parasites also play an important rôle in the production of pathologic conditions. Among them are the *Amœba coli*, the *Hæmatozöon malariæ*, *etc.* It is believed, though not yet demonstrated, that to some protozoa are due scarlet fever, measles, and smallpox. There are also parasitic worms which produce diseases such as tapeworm, lumbricoides, filaria (qq.v.), etc. The special pathology of the different diseases is considered under the proper title for each disease.

Consult: Green and Murray, *Pathology and Morbid Anatomy* (Philadelphia, 1900); Stengel, *Textbook of Pathology* (ib., 1901); Schmaus and Ewing, *Pathology and Pathological Anatomy* (ib., 1902).

PATH'ROS. The Hebrew corruption of the Egyptian name for Upper Egypt, *Pa'to'rēs*, literally 'the South-land.' It occurs in five passages of the Old Testament: Isaiah xi. 11; Jeremiah xliv 1-15; Ezekiel xxix. 14; xxx. 14. The name was probably pronounced *Pathoris* by the Hebrews, as is indicated by the Greek rendering Παθούρης and Φαθούρις. In Assyrian it appears as *Paturisi*. The Pathrusim, mentioned in Genesis x. 14 and I. Chronicles i. 12, are the people of Pathros or Upper Egypt. Consult Erman, in *Zeitschrift für die alttestamentliche Wissenschaft*, vol. x. (Giessen, 1890).

PATIALA, pŭt'i-ä'lä. An eastern native State of the Punjab, India. Area, 5951 square miles. Population, in 1891, 1,583,521; in 1901, 1,586,030. Capital, Patiala.

PATIALA. The capital of a native Punjab State of the same name, India, 25 miles southwest of Ambala (Map: India, C 2). Population, in 1891, 55,856; in 1901, 53,545. There are about 5000 Sikhs; the rest are almost equally divided between Hindus and Mohammedans.

PATIENCE. A comic opera by Sir Arthur Sullivan with libretto by W. S. Gilbert (1881). It is a satire on the æsthetic craze in England in

typified in the ridiculous character [illegible]. It was one of the most successful of Savoy operas.

PATINIR, pä'te·nēr', or **PATENIER**, -nyā', JOACHIM (c.1490-1524). A Flemish painter, born at Dinant. He was probably the pupil of Gheeraedt David at Bruges. Afterwards he lived in Antwerp, where Albrecht Dürer painted his portrait on the occasion of his second marriage in 1521. He was the first of the Flemish painters to make figures subordinate to the landscape in his pictures. He had little knowledge of perspective, and the small figures he introduced are fantastically grouped. He painted with extreme detail. His best pictures are: "Baptism of Christ," Vienna Museum; "Virgin of the Seven Sorrows," Brussels Museum; "Temptation of Saint Anthony," and "Repose in Egypt," Madrid Museum.

PATKUL, pät'kul, JOHANN REINHOLD VON (1660-1707). A Livonian nobleman, prominent as an opponent of the Swedish power during the last part of the seventeenth century and the beginning of the eighteenth. He was born at Stockholm, where his father was then a prisoner of State, and after receiving a military education entered the Swedish Army and rose to the rank of captain. His bold advocacy of the rights of the Livonian nobility, which the Swedish Crown had suppressed, gained him the hatred of Charles XI., who in 1694 condemned him to mutilation and the loss of his estates. Patkul escaped, and, in 1698, took service with Augustus the Strong, Elector of Saxony and King of Poland, as a member of the Privy Council. He was instrumental in bringing about the alliance of Russia, Poland, Saxony, and Denmark against Charles XII. in 1700, but soon after left the Saxon Court and entered the service of Peter the Great. In 1704 he was Russian Ambassador at Warsaw, where his outspoken criticism of the conduct of Augustus led to his being imprisoned. In the Treaty of Altranstädt concluded between Saxony and Sweden in 1706, Augustus promised to surrender Patkul to Charles XII., but privately gave orders to the commandant of the prison to connive at his escape. Before this could be effected, however, a Swedish detachment entered Warsaw and Patkul was delivered into their hands. At Kazimierz, near Posen, on October 10, 1707, Patkul was broken on the wheel and quartered as a traitor to his country. Consult Buchholz, *Beiträge zur Lebensgeschichte J. R. Patkuls* (Leipzig, 1803).

PAT'MORE, COVENTRY KEARSEY DIGHTON (1823-96). An English poet, born at Woodford, Essex. His earliest publication was a volume of *Poems* (1844), praised by Bulwer and utterly condemned by *Blackwood* in an unsparing review. He also contributed to various periodicals, in particular to the *North British* and the *Edinburgh*, critical articles, which, although marked by valuable detached observations, are unsatisfactory because of his failure to understand work other than his own. It was he who asked Ruskin to send to the *Times* the latter's famous letter in defense of the Pre-Raphaelites, and he wrote for the *Germ* an essay on *Macbeth*, and verse, including *The Seasons*. However, he was not much concerned with the Pre-Raphaelite movement, and latterly at least held no complimentary opinion of Rossetti. He was at one time a disciple of Tennyson, and in 1850 recovered the manuscript of *In Memoriam* from a cupboard in which it had been left. From 1846 to 1866 he was assistant in the printed-book department of the British Museum. His published verse includes: *The Angel in the House* (in part, 1854; complete, 1863; last ed. 1896); *The Unknown Eros and Other Odes, i.-xxxi.* (1877); and *Poems* (in a definitive edition, with a treatise on English metrical law, 1886; reprinted, 1890, 1894, 1897). Of these, the more pretentious are in narrative form, quite lacking in any unity of interest and at times bathetic, but with fine isolated passages, particularly convincing descriptions of natural scenery, set in the mass of context. His triviality and baldness have been perhaps too monotonously dwelt upon by the critics, and the high esteem of eminent contemporaries is not wholly to be disregarded; but his work seems much less remarkable than his rugged and striking personality. Of his prose may be mentioned *Principles in Art* (1889; new revised and rearranged ed. 1898), essays reprinted from the *Saint James's Gazette*, and *Religio Poetæ* (1893; revised and rearranged, 1898). He wrote, also, a memoir of the poet Procter, better known as 'Barry Cornwall' (1877). Consult Champneys, *Memoirs and Correspondence of Coventry Patmore* (London, 1900).

PAT'MOS (Lat., from Gk. *πάτμος*). An island of picturesque and irregular shape, about 10 miles in extent from north to south, lying off the coast of Asia Minor (Map: Turkey in Asia, B 4). The most prominent physical feature of the island is its masses of volcanic hills, which rise 800 feet at their highest point. The island has borne no conspicuous part in history and owes its reputation to the reference made to it in the Bible (Rev. i. 9), where it is stated that Patmos was the place to which Saint John was exiled and that there he received the visions contained in the Book of Revelation. The island is now under Turkish rule and its condition has steadily deteriorated. The most important feature of modern Patmos is the Monastery of Saint John, founded in the eleventh century. Here was once gathered a very valuable library, many of the most important books in which have been sold.

PATNA. A native State of India, feudatory to the Central Provinces (q.v.). Area, 2399 square miles. Population, in 1891, 332,197; in 1901, 277,566. After having been several years under British administration, the State was restored to a descendant of its ancient Rajput rulers.

PAT'NA. A division of Behar, Bengal (q.v.), British India, comprising the districts of Patna, Gaya, Shahabad, Saran, Champaran, Muzaffarpur, and Darbhangarh. Area, 23,686 square miles. Population, in 1891, 15,811,600; in 1901, 15,464,400. It is watered by the Ganges and its tributary, the Son. The climate is very hot in summer and mild in winter. The soil is fertile and well cultivated. Rice, wheat, and barley are grown, and the opium poppy is extensively raised. Capital, Patna (q.v.).

PATNA. The capital of a district and division of Bengal, British India, on the right bank of the Ganges, 130 miles east of Benares (Map: India, E 3). It covers a large area, stretching with its suburbs for 9 miles along the river

bank; its streets are crooked and dirty, and there are few interesting buildings. The Golah, a large, circular structure with walls more than 12 feet thick, originally built as a granary, is remarkable for its acoustic properties. The city has extensive bazaars, contains the largest opium factories in India, and is an important centre for the indigo trade. In the European quarter on the west are a Roman Catholic cathedral, Protestant churches, Government offices, schools, the Nabob's palace, and the great tank.

Patna, under the former name of *Padmavati*, or Lotus City, is supposed to have been the capital of Behar as early as B.C. 419. Here, at an early period, the East India Company established factories, and traded in opium, rice, etc. In 1763 disputes about transit-duties arose between the company's servants and the native Government. A war ensued, resulting in the British taking possession of the district. Patna was the headquarters of the Wahabi or Mussulman conspiracy in 1864. It lies on the principal railroad of the Ganges Valley, and also has considerable shipping on the river. Population, in 1891, 165,192; in 1901, 134,785, most of whom were Hindus, with about 40,000 Mohammedans and 500 Christians.

PA'TON, Sir Joseph Noel (1821-1901). A Scottish historical painter. He was born at Dunfermline, Scotland, December 13, 1821. His first work in art was the designing of patterns for damask fabrics. He entered the Academy Schools, London, in 1843, and in 1845, as well as two years later, his designs received prizes in the Westminster Hall Competition. He became a member of the Royal Scottish Academy in 1850, and in 1857 he settled in Edinburgh. In 1866 he received the appointment of Queen's Limner for Scotland, and was knighted in 1867. He made the cartoons for the glass of the great windows of Dunfermline, restored in 1884 by Andrew Carnegie. He died at Edinburgh, December 10, 1901. His subjects are drawn from fairy tales, history, poetry, and religious lore, and his painting, though imaginative and sympathetic, is faulty in drawing and sometimes harsh in color. His chief works include "The Spirit of Religion" (1845); "Reconciliation of Oberon and Titania" (1847), National Gallery, Edinburgh; "Home from the Crimea" (1856); "Luther at Erfurt" (1861); "Death Barge of King Arthur" (1865); "Love in Tenebris" (1879).

PATOS, pä'tosh, Lagoa dos. A lake in Brazil. See Lagoa dos Patos.

PATRAS, pä'trâs, or **PATRÆ**. A fortified seaport of Greece and the capital of the Nomarchy of Achaia, situated in a fertile plain on the Gulf of Patras (Map: Greece, C 3). The town is dominated by a citadel-crowned ridge, the site of the ancient acropolis. It is well built, with wide and straight streets, and has a fine church and post-office, a high school, and ruins from ancient Greek and Roman times. The harbor is only a roadstead, protected by a breakwater, but the town is, nevertheless, an important trade centre, and the seat of a United States consul. The chief exports are currants, wine, oils, valonia, and skins. Population, in 1889, 33,529; in 1896, 37,958. Patras was one of the foremost among the 'twelve cities' of Achaia, and during the Middle Ages was the chief commercial city of the Peloponnesus. It was destroyed by the Turks in 1821, but was soon rebuilt.

PATRIA POTESTAS (Lat., paternal power). The power of the father over his children in early Roman law was similar to that which existed among other Aryan peoples at the same stage of social development. (See Parent and Child.) What was peculiar in later Roman law was the extent to which this early power was maintained even at an advanced stage of civilization, and the duration of the power, in the case of sons, until the father's death. Daughters (at least in the earlier law) passed out of the paternal power upon marriage, but sons remained subject even after their marriage. The son had no *potestas* over his children until his father's death. *Patria potestas* was thus the authority not merely of the father over children, but of the ancestor over all descendants in the male line (son's children, son's son's children, etc.).

In early Roman law the father had an unlimited right to expose all infant daughters except the first-born. Sons and first-born daughters might also be exposed if they were deformed and the deformity were attested by five of the nearest neighbors. The father had also, as domestic magistrate, the right to punish his children, even with death, after a trial at which the kinsmen were present. These paternal rights existed throughout the Republican period, unchecked except by the arbitrary power of the censors and of the popular assembly to punish abuses of paternal power. In the Imperial period, however, exposure of children was forbidden and the right of punishment was reduced within disciplinary limits.

The father had also the right to sell the child. Sale into slavery was unusual; in the later Empire it was permitted only in the case of new-born children and only when the father was in extreme poverty, and even then the father retained the right of ransom. To pledge the person of a child for the father's debt (which was originally accomplished by sale with the right of ransom) was not uncommon, nor was this practice forbidden until the Imperial period. It was also not unusual for a father to sell his son's services for a number of years. A so-called royal law (i.e. a rule of the old religious law; see Civil Law) forbade the sale of a married son; and another royal law declared that a son sold three times should be free from the father—a rule of which the jurists took advantage in devising a form of emancipation (q.v.). Sales of children for the purposes of emancipation or of adoption into a new family, and sales of daughters as a method of giving them in marriage, were of course purely formal.

Sons and daughters under *patria potestas* had no property of their own; whatever they acquired was acquired for the head of the house. In the Imperial period, however, the son and also the daughter obtained property rights: (1) Whatever the son acquired in the military or civil service of the Empire (*peculium castrense, quasi castrense*) was his own; (2) whatever a son or daughter acquired from the mother or from maternal relations (*bona materna, materni generis*), and, finally, whatever a son or a daughter acquired from anyone except the father (*bona adventicia*), passed indeed into the control and usufruct of the father, but the equitable interest was in the child. Accordingly the father was for-

bishop to real land thus acquired, and his estate was accountable to the children for all goods and money thus acquired.

With the development of the legal recognition of the child's right to life came the recognition of his right to support. With the development of independent property rights of the child came the duty to support an indigent parent.

Even at early Roman law there was one field in which sons were independent, viz., that of public law. The son under paternal authority had political rights and was eligible to office; and, if clothed with official power, he could control the actions of the father.

Paternal authority existed over children born to the father in lawful marriage. In the later Empire children born of a concubine (*filii naturales*) could be legitimized by the subsequent marriage of their parents or by rescript of the Emperor. Children thus legitimized and children brought into the family by adoption (*arrogatio* or *adoptio plena*; see ADOPTION) were subject to *patria potestas*.

Patria potestas was extinguished not only by the death of the father, but by his loss of liberty or of citizenship (*capitis deminutio maxima, media*). His capture and enslavement by foreign enemies, however, only suspended his paternal authority, and if he escaped or was ransomed it revived. The practical meaning of the rule was that condemnation to any penalty which carried with it loss of freedom or of citizenship destroyed *patria potestas*. Forfeiture of paternal authority was also imposed, by Imperial legislation, on the father who exposed his child or prostituted his daughter. The marriage of a daughter extinguished her father's authority as long as marriage (q.v.) carried the woman into the power (*manus*) of her husband; but when the free marriage was developed, the married woman remained under her father's authority. Even in such a marriage, however, her children were under the paternal authority of her husband or of her husband's father. Paternal authority was extinguished, in the older Roman law, when a son became a flamen of Jupiter or a daughter became a vestal virgin. In the law of Justinian the same result attached to the elevation of the son to the episcopate or his appointment to any important secular office. Finally, paternal authority was extinguished when the son or daughter was voluntarily emancipated or transferred to an adopted father. The emancipation of children originally deprived them of all right of inheriting property in their original family except by testament; but this result was obviated, as regarded the father's estate, by the praetorian edict, and, as regarded the estates of brothers, sisters, and paternal relatives, by Imperial legislation. Consult the authorities referred to under CIVIL LAW.

PATRIARCH (Lat. *patriarcha, patriarches*, from Gk. *πατριάρχης*, patriarch, chief of a tribe, from *πατριά, patria*, lineage, from *πατήρ, patēr*, father + *ἀρχή, archein*, to rule). The name given to ten personages appearing in the antediluvian period of biblical history, who are, however, supposed by many modern scholars to represent traditional epochs or dynasties, similar in character to and standing in some connection with Berosus's list of antediluvian dynasties in Babylonia. See METHUSELAH.

In the history of the Christian Church, the title is applied to the bishops of certain great metropolitan sees of a wider jurisdiction than other metropolitans. The three earliest instances seem to be directly connected with a tradition of the establishment of those sees by Saint Peter. These are the three which the First Council of Nicæa asserts to be recognized by ancient custom —Rome, Antioch, and Alexandria. After the translation of the seat of empire to Byzantium, thenceforward called Constantinople, that see, which had originally been subject to the Metropolitan of Heraclea, obtained first metropolitan and then patriarchal rank, and eventually established a precedence over Antioch and Alexandria, being ranked second only to Rome. To these four patriarchates was added in 451 that of Jerusalem, which was formed out of the ancient Patriarchate of Antioch. The limits of these five patriarchates can only be loosely assigned. These patriarchs had authority to consecrate the metropolitans under their jurisdiction, and to preside over councils and high judicial tribunals within the same limits. After the Greek schism, and particularly after the establishment of the Latin Kingdom of Jerusalem, Latin prelates were appointed with the rank and title of patriarch in each of the four great Eastern sees. Since then there have been a number of patriarchs in the East, among the Greek Orthodox (one for Russia created in 1589 and removed by Peter the Great), among the Nestorian and Eutychian communities, and among those who have returned to union with Rome.

Besides the five greater patriarchates, there have been others in the West known by the name of minor patriarchates. The controversy of the Three Chapters (see CHAPTERS, THE THREE) gave the Bishop of Aquileia an opportunity to assume this title, whereupon the orthodox Bishop of Grado asserted an equal right to it. It remained in the former line even after the first bearer made his submission, until Benedict XIV. abolished it; that of Grado was transferred to Venice in 1451. In France the Bishop of Bourges at times claimed the title, and Napoleon had the idea of creating a French patriarch. Pope Paul III. granted the dignity of Patriarch of the Indies to the grand chaplain of the King of Spain, and the King of Portugal asked a similar dignity for his grand chaplain, with his see in Lisbon. As a matter of fact, by the concordat of 1886 which regulated the relations between Church and State in the Portuguese East Indies, the honorary title was conceded to the Archbishop of Goa.

PATRIARCHAL CROSS. A cross which, like the patriarchal crosier, has its upright part crossed by two horizontal bars, the upper shorter than the lower. A cross patriarchal fimbriated or was a badge of the Knights Templars.

PATRIARCHATE. (1) The rule or jurisdiction of a father. (2) Any social group, as a family, a clan, or a tribe, living under the rule of a father or eldest male member of the group. The term stands for an important stage in the development of human society, and for an important theory commonly called the patriarchal theory. In nomadic communities, and often in simple agricultural populations, there are found compound families, in which two or three generations of relatives, including many brethren

with their wives and children, live together under the rule of the eldest male, and in the common ownership of a household property. The society of the ancient Hebrews in the very early days is described in the Old Testament as patriarchal. The nomadic tribes of the Arabian desert and of the steppes of Central Asia are patriarchal now. The family and clan organization of the ancient Greeks and of the ancient Romans was patriarchal, and a large proportion of the Slavic population of Russia and of Southeastern Austria is patriarchal still. In its simplest form the patriarchal theory is stated by Aristotle in the opening pages of the *The Politics*. Society is represented as springing from a single family, consisting of a man and his wife and children. The children and children's children continue to live with the first father, acknowledging him as chief or patriarch as long as he lives. On his death his descendants divide into as many families as he has sons with offspring. Each such son becomes the patriarch of a new compound family. In the course of time many such related families, living in one district and speaking one tongue, become a tribe. Tribes enlarging divide, but if they do not separate too far they presently confederate and become a nation. This simple theory underwent great modification through the researches of Sir Henry Sumner Maine, who in *Ancient Law* (London, 1861) showed that the patriarchal family of the Romans was a partly natural, partly artificial group held together by the supreme power (*potestas*) of the eldest male. Membership in the group might be acquired through adoption as well as by actual descent from the first father, and it could not be acquired through blood relationship on the side of the mother. Neither males nor females not subject to the father's power were accounted of the group, and property descended only through kinship in the male line. The group was thus essentially not a compound family, but, rather, a clan or gens. (See GENS.) Maine attempted to prove in this work, and later in *Early Law and Custom* (London, 1883), that this highly artificial patriarchal system had been general among Aryan peoples. A destructive criticism of Maine's theories by John F. McLennan, *The Patriarchal Theory*, edited and completed by Donald McLennan, was put forth (London) in 1885. In this work it was shown that the patriarchal family has everywhere been preceded by the clan and family system based on kinship through females, and that the true *patria potestas* has been of exceptional occurrence, even after the patriarchal system has been established. Substantially the same conclusions are maintained by W. Robertson Smith, *Kinship and Marriage in Early Arabia* (London, 1885). An exceedingly interesting and instructive account of the economic aspect of patriarchal institutions, especially in Slavic communities, is found in Laveleye's *De la propriété et de ses formes primitives* (Paris, 1874; translated, *Primitive Property*, London, 1878). See MATRIARCHATE; MARRIAGE.

PATRIARCHS, TESTAMENT OF THE. See APOCRYPHA, section on *Old Testament*.

PATRIARCHS, TESTAMENTS OF THE TWELVE. See APOCRYPHA, section on *Old Testament*.

PATRICIAN (Fr. *patricien*, from Lat. *patricius*, of the rank or dignity of the fathers, from *pater*, Gk. *πατήρ*, *patēr*, Skt. *pitar*, father; connected with Goth. *fadar*, OHG. *fatar*, Ger. *Vater*, AS. *fæder*, Eng. *father*). A name given to the members of the original Roman *gentes*, of whom the *populus Romanus* consisted, and to their descendants by blood and adoption. The amalgamation of the three tribes of Ramnes, Tities, and Luceres gave rise to a distinction between *patres majorum gentium* and *patres minorum gentium*—the latter term being applied to families recently elevated to an equality with the old patrician class. On the establishment of the plebeians as a distinct order, sharing certain rights with the patricians, the patriciate became an aristocracy of birth, in the exclusive possession of a number of important privileges. A long struggle between the two orders ended in the attainment by the plebeians of a political equality, and the establishment of a new aristocracy of *nobiles* based on wealth and office. From B.C. 300 the old political distinction between patricians and plebeians had no real existence, except that patricians were ineligible to the tribunate of the plebs. The Empire made an end even of this relic of earlier days. Under Constantine the dignity of *patricius* became a personal title, not hereditary, but conferring very high honor and certain privileges. It was created at Constantinople, and not confined to Romans or subjects of the Empire, but sometimes bestowed on foreign princes. These patricians, unlike the old Roman order, were distinguished in dress and equipage from the ordinary citizens. The popes in after times conferred the same title on eminent persons and princes, including many of the German emperors. In several of the Germanic kingdoms the title of patrician was bestowed on distinguished subjects, and in some parts of Italy the hereditary nobility are still styled patricians. See ROME; PLEBEIANS.

PAT'RICK, SAINT (373?-463?). The apostle of Ireland. Of the existence of this holy man there is no question, but every other fact about him has been hotly disputed. This is the more strange as he left an autobiography, but as his object in it was rather to exalt the work than the worker, he was not careful to give facts in their chronological order or to detail his life; so that for the purposes of a sketch of his life the document has little value. According to the facts which can be gathered from this work Patrick was born at Banavem Tabernie, in Scotland, probably identical with the modern Dumbarton, on the Leven near its confluence with the Clyde, a few miles northwest of Glasgow. His father was Calpornius, deacon in the Church, also a decurion and a man of means and standing. His baptismal name was Sucat. When he was sixteen years old he was captured by pirates and carried to Ireland, where he was sold to Miliuc, chieftain of North Dalaradia, in the County of Antrim, North Ireland. He lived as a slave for six years, employed in tending cattle. His sad condition drove him to find consolation in God, and he learned to wait upon the divine will. In obedience to a divine intimation, he fled from his master and journeyed south 200 miles. He found a ship about to sail for France, and after a little parley was taken on board as a servant, and in three days landed at the mouth of the Loire. Then for twenty-eight days he traversed a wild country with the ship's company until they came to Marseilles. Here he parted

[illegible] patrician and went to Tours, where [illegible] Martin (q.v.) was Bishop. If, as [illegible] accounts state, his mother was the sister of [illegible] Martin, his going to Tours was the more natural. He lived with Martin for four years. At last he returned to Scotland. But the desire to devote himself to preaching the Gospel to the Irish was strengthened by visions and voices, and he went to Auxerre in France to be consecrated by Bishop Amator. It was on this occasion that he assumed the name of Patrick, by which he is now exclusively known. In 405 he began his missionary work in Ireland, and the rest of his long life was spent in incessant labors with commensurate success. He came to Ireland with a thorough knowledge of the language and of the people and seems to have encountered little opposition. He found no Christians and left no heathen. It is probable that he died at Armagh in 463. His bell is in the Museum of Arts and Sciences in Dublin; his crosier was preserved till the Reformation, but then unfortunately it was burned.

Besides the Patrick of history there is the Patrick of legend, and the less attractive Patrick of controversy. Among the many legends which have gathered about him the most familiar is that he banished the snakes from Ireland. Others represent him as escaping from his foes by miraculous agencies. For example, it is related that on one occasion when a company was lying in wait to slay Patrick and his companions, he chanted his hymn, called a 'Breastplate,' and the opponents mistook the Christians for wild deer with a fawn behind them. These legends have enhanced Patrick's reputation and doubtless some of them have some foundation in fact. The Patrick of controversy is now by birth a Frenchman, now an Irishman; now of the third century, now mythical; now a Presbyterian, now a devoted follower of the Roman Church; now deriving his orders from Scotland and now from Rome; now remarkably successful, now really accomplishing very little.

Patrick was emphatically a man of deeds and not of words, and so his literary remains are few, though of great interest. First is his autobiography, which he calls his *Confession*. This was written in Latin, in which tongue he had become very rusty. Next comes his Epistle to Coroticus, a Welsh prince, who had taken captive some of the Irish Christians. Patrick wrote to secure, if possible, their release. Finally, his hymn in Irish, called a 'Breastplate,' which is a confession of faith, showing plainly the very simple character of Patrick's faith. Other remains bearing his name have not such good claim to be called genuine. All his remains, genuine and disputed, are in Migne, *Patr. Lat.*, liii.; also in better shape with the *Tripartite Life*, one of the sources of his biography, in the "Rolls Series," No. 89, two parts, edited by Whitley Stokes (London, 1887). For English translations of his genuine works and notes, consult: Wright, *The Writings of Patrick, the Apostle of Ireland* (London, 1889); and Olden, *Epistles and Hymns of Saint Patrick* (Dublin, 1876; 3d ed. 1895). For his life, consult: Miss Cusack, *Life of Saint Patrick, Apostle of Ireland* (London, 1871, with a translation of the *Tripartite Life* from the original Irish by Hennessey); also Todd, *Saint Patrick, Apostle of Ireland* (Dublin, 1864); Morris, *Ireland and Saint Patrick* (London, 1888); Newell, *Saint Patrick, His Life and Teaching* (ib., 1890); Shearman, *Loca Patriciana* (ib., 1879).

PATRICK, Saint, Order of. See Saint Patrick, Most Illustrious Order of.

PATRICK, Simon (1626-1707). A Church of England divine. He was born at Gainsborough, Lincolnshire, and graduated from Queen's College, Cambridge, in 1648. He took orders, and in 1655 was received as chaplain into the family of Sir Walter Saint John, of Battersea. In 1662 he was appointed rector of Saint Paul's, Covent Garden, London, and endeared himself to his people by faithful instructions, and especially by remaining with them during the plague of 1665. In 1671 he was made chaplain in ordinary to the King. In 1672 he was made prebendary of Westminster, and in 1679 Dean of Peterborough. During the reign of James II. he defended Protestantism. In 1689 he was made Bishop of Chichester, and in 1691 transferred to the see of Ely. In his early life he wrote against the Non-Conformists, in a pamphlet entitled *A Friendly Debate Between a Conformist and a Non-Conformist* (1669), but after he became bishop he changed his opinion, regarded them with favor, and used his influence to allay strife. He stood next to Tillotson in learning and influence. Among his numerous works were: *Mensa Mystica, or A Discourse Concerning the Sacrament of the Lord's Supper* (1660); *The Heart's Ease, or a Remedy Against Trouble* (1660); *The Parable of the Pilgrim* (1664); *The Christian Sacrifice* (1671); *The Dignity of the Christian Priesthood* (1704). His paraphrases upon the books of the Old Testament from Genesis to Solomon's Song were published in ten volumes between 1695 and 1710. They are included with the commentaries of Lowth, Arnold, Whitby, and Lowman, in *A Critical Commentary and Paraphrase on the Old and New Testament and the Apocrypha* (London, 1809). A complete edition of his works was published in 1858 by the Rev. Alexander Taylor, in nine volumes. His *Autobiography* was published at Oxford in 1839.

PA'TRIOFE'LIS (Neo-Lat., from Lat. *patrius*, relating to a father, hereditary, ancient + *felis*, cat). A fossil creodont mammal found in the Middle Eocene (Bridger) beds of Wyoming, and of interest because it is considered by some authors to be the ancestor of the modern seals. Other writers, basing their conclusions on more recent examination of the material, consider Patriofelis to have been a terrestrial creodont with habits similar to those of the cats and presenting a lateral line of evolution that seems to have no descendants among modern carnivores. The animal, as indicated by the finely mounted skeleton in the American Museum of Natural History, was of heavy build, about six feet in length with low, crouching attitude, flexed limbs, and long tail. The skull is rather large, with small brain case, and a prominent posterior crest. The powerful jaws are armed with sharp cutting teeth. The feet are digitigrade with spreading clawed toes. Oxyæna, from the Wasatch lower Eocene beds, is a more slender, less specialized ally of Patriofelis. Consult: Wortman, "Osteology of Patriofelis, a Middle-Eocene Creodont," in *Bulletin of the*

American Museum of Natural History, vol. vi. (New York, 1894); and Osborn, "Oxyæna and Patriofelis Re-Studied as Terrestrial Creodonts," in *Bulletin of the American Museum of Natural History*, vol. xiii. (New York, 1900).

PATRIOTIC SOCIETIES (Mk. *patrioticus*, from Gk. *πατρωτικος*, *patriōtikos*, relating to descent or to a fellow-countryman, from *πατρώτης*, *patriōtēs*, fellow-countryman, from *πατρια*, *patria*, race, country, from *πατήρ*, *patēr*, father). Societies having as their objects the preservation of the records of important events in history, and especially of the wars in which the United States has participated; the encouragement of love of country; the saving and restoration of historical sites and objects; the celebration of anniversaries of historic events; and the fostering of fraternal feeling and intercourse among veterans.

Of the colonial period, the first of the hereditary patriotic bodies is the Society of the Mayflower Descendants. (See MAYFLOWER DESCENDANTS, SOCIETY OF.) The Society of Colonial Wars admits to membership adult male descendants of Colonial ancestors of distinction. (See COLONIAL WARS, SOCIETY OF.) Similar to the foregoing is the Order of the Founders and Patriots of America. Besides colonial ancestry, it requires that its members shall be descended from ancestors who were loyal to the colonies during the War of the Revolution. (See FOUNDERS AND PATRIOTS OF AMERICA, ORDER OF.) Of like character is the Settlers and Defenders of America (q.v.), which admits both men and women. The first patriotic hereditary society of women to be organized was the Society of Colonial Dames of America. It admits on invitation women who are directly descended from some ancestor of worthy life who resided in an American colony before 1776. (See COLONIAL DAMES OF AMERICA, SOCIETY OF.) Broader in its scope is the National Society of Colonial Dames of America. It admits on invitation women who are descended from an ancestor of worthy life who resided in an American colony prior to 1750. (See COLONIAL DAMES OF AMERICA, NATIONAL SOCIETY OF.) The Society of Daughters and Patriots of America admits to membership by invitation women who are descended in the direct paternal line of either father or mother from an ancestor who settled in the colonies before 1687, and of an ancestor in the same line who was loyal to the colonies during the War of the Revolution. In New York City there is the Holland Society (q.v.), which admits to membership male descendants in the direct male line of a man of Dutch blood resident in America before 1675.

Commemorating the period of the great struggle between the colonies and Great Britain are a number of hereditary societies, of which the oldest and best known is the Society of the Cincinnati (q.v.), which admits to membership descendants of officers who served in the Continental Army for at least three years. Following the centennial celebration of the battle of Lexington, there was organized in San Francisco, Cal., on October 22, 1875, the Sons of Revolutionary Sires, which, on April 30, 1889, became the Society of the Sons of the American Revolution. (See SONS OF THE AMERICAN REVOLUTION, SOCIETY OF THE.) The Society of the Sons of the Revolution has priority over the previously mentioned society in the Eastern States, and has almost identical requirements, for it admits to membership lineal descendants of participants in the War of the Revolution. (See SONS OF THE REVOLUTION.) Similarly the Naval Order of the United States (q.v.) admits to membership any officer, or descendant of one, who served in the naval forces of the United States during the War of the Revolution or any of the subsequent wars. Enlisted men who have received the naval medal of honor are also eligible to membership. One of the most distinguished among the patriotic societies is the Military Order of Foreign Wars, which admits to membership commissioned officers who participated in the foreign wars of the United States, and their direct lineal descendants in the male line. See FOREIGN WARS, MILITARY ORDER OF.

Originally the Sons of the American Revolution admitted to membership women, but, this being found unsatisfactory, special organizations were instituted for women, the first of which was the Society of the Daughters of the American Revolution, which admits any woman of acceptable character descended from an ancestor who rendered material aid to the cause of independence. (See DAUGHTERS OF THE AMERICAN REVOLUTION, SOCIETY OF.) Of similar nature is the Daughters of the Revolution (q.v.). Other societies are the Daughters of the Cincinnati, organized in New York City in 1894, and the Dames of the Revolution, organized in New York City in 1896. The Society of the Children of the American Revolution, with a membership of over 5000, was organized in Washington in 1895.

Of the period subsequent to the War of the Revolution and prior to the Civil War, there are comparatively few associations that are both patriotic and hereditary, although worthy of mention of that character is the Saint Nicholas Society of New York, organized in New York City on February 28, 1835. This society admits natives or residents of New York State who are descended from residents of the State prior to 1785. The American Order of Louisiana was organized in Denver, Colo., on December 20, 1901, and admits to membership descendants of those who rendered distinguished services in the settlement and civilization of the Louisiana Purchase States, from 1803 to 1903. The War of 1812 is commemorated by the Veteran Corps of Artillery. (See WAR OF 1812, MILITARY SOCIETY OF THE, by which name it has been known since 1892.) The General Society of the War of 1812 admits to membership any male person who is lineally descended from a participant in the War of 1812. (See WAR OF 1812, GENERAL SOCIETY OF.) Corresponding to the last mentioned is the Society of the United States Daughters, 1812. (See UNITED STATES DAUGHTERS OF 1812.) The memory of the War of Mexico is preserved by the Aztec Club of 1847 (q.v.). The Association of Mexican Veterans admits to membership descendants of any participant who served in that war.

The Civil War proved rich in the formation of commemorative societies. One of the most important of these is the Military Order of the Loyal Legion, which admits to membership officers who participated in the war, and as a second class the eldest sons of living original members. (See LOYAL LEGION OF THE UNITED

S. A. (See Military Order of.) The Grand Army of the Republic (q.v.), popularly known as the G. A. R., admits to membership any soldier or sailor who was honorably discharged after service. As the Grand Army grew in strength, there was organized as an auxiliary the Woman's Relief Corps (q.v.), which admits to membership mothers, wives, daughters, and sisters of Union soldiers. Also auxiliary to the Grand Army is the Sons of Veterans (q.v.). The Union Veteran Legion (see Veteran Legion, Union) draws the line a little closer than the G. A. R., for it admits only those who volunteered prior to July 1, 1863, for a term of three years. That is to say, it will not admit any drafted person or substitute. It has as an auxiliary the Ladies of the Union Veteran Legion, which was organized in Newark, Ohio, on February 20, 1890. The Union Veteran Union (see Veteran Union, Union) admits veterans who served between April 12, 1861, and April 30, 1865, and who participated in one or more engagements or battles, and received an honorary discharge. Of broader scope than the foregoing is the Regular Army and Navy Union of the United States of America (q.v.), in which any honorably discharged soldier, sailor, or marine, without regard to time or length of his service, is eligible for membership. Of worthy recognition in this connection is the Medal of Honor Legion (q.v.), which is composed of officers and enlisted men who have received the medal of honor (q.v.) for distinguished conduct in action. The United States Veteran Navy (q.v.) admits to membership any officer or enlisted man in the naval service during the period of the Civil War or during the Spanish-American War. There is also the National Association of Naval Veterans, to which any officer or enlisted man who served in the navy or marine corps during the period of the Civil War is eligible. (See Naval Veterans, National Association of.) Mention should also be made of the Society of the Army of the Cumberland, Society of the Army of the Potomac, and Society of the Army of Tennessee, as well as the Eleventh Army Corps Association, whose character is evident from their names. They now admit to membership descendants of original members, thus becoming hereditary societies.

The history of the Confederate States of America is preserved by three organizations, the oldest of which is the United Confederate Veterans, which admits to membership any soldier or sailor who served in the Confederate service during the Civil War. (See Confederate Veterans, United.) The United Sons of Confederate Veterans admits to membership any male descendant over sixteen years old of a soldier or sailor who served in the Confederate Army or Navy. (See Confederate Veterans, United Sons of.) The United Daughters of the Confederacy admits to membership the widows, wives, mothers, sisters, and lineal descendants of those who served in the army or navy of the Confederate States. See Confederacy, United Daughters of the.

The long period between the Civil War and the war with Spain saw the organization of two patriotic societies, the Order of the Indian Wars of the United States, founded at Chicago in 1896, and the Society of Veterans of Indian Wars of the United States, established at Philadelphia in the same year. The War with Spain (1898) was prolific in the formation of war societies. Corresponding to the Loyal Legion is the Naval and Military Order of the Spanish-American War, which admits to membership officers who were on the active list in the United States army, navy, marine corps, or revenue marine, during the War with Spain, or the subsequent insurrection in the Philippines. (See Spanish-American War, Naval and Military Order of.) The most important organization of this period, however, is the Spanish War Veterans (q.v.), which admits to membership soldiers and sailors of the volunteer army and marine corps who served honorably during the war. Of similar nature is the Society of Spanish-American War Veterans, which was organized in Trenton, N. J., on December 14, 1899. Arrangements were concluded in 1903 for the consolidation of this organization with the Spanish War Veterans. The Society of the Army of Santiago de Cuba admits to membership all officers and soldiers of the United States Army who served with the expeditionary force to Santiago de Cuba. (See Santiago de Cuba, Society of the Army of.) The occupation of Porto Rico gave rise to the Military and Naval Society of the Porto Rican Expedition. (See Porto Rican Expedition, Military and Naval Society of.) The members of the first regiment of United States Volunteer Cavalry that served in Cuba, before disbanding, organized the Rough Riders' Association. The Spanish-American War in the West Indies was also productive of the Society of the Caribbean, which was founded by American war correspondents who participated in the naval and military campaigns in Cuba and Porto Rico. Service in the Philippines led to the organization of the National Society of the Army of the Philippines. Membership is extended to soldiers and sailors who served during the war in the Philippine Islands. The Military Order of the Carabao was formed in the Philippines by officers who served in those islands during the fighting period, and any officer is eligible to membership who was there prior to July 4, 1902. Participants in the Chinese expedition for the relief of Peking, on their return to Manila, organized the Military Order of the Dragon.

Mention must be made of such organizations as the Mount Vernon Ladies' Association, which has for its special purpose the preservation of the home of Washington. Of similar nature is the Ladies' Hermitage Association, which cares for the home of Andrew Jackson, near Nashville, Tennessee, and the Betsy Ross Memorial Association, which has saved the house in Philadelphia where the first American flag was made. The Landmarks Club in Los Angeles is doing a splendid work in the restoration and preservation of the old missions which were left to us by the Spanish occupants of Alta California and the beautiful missions near San Antonio are cared for by an organization of women in Texas. In Colorado the cliff dwellings of the Mancos Cañon have been leased by the Colorado Cliff Dwellers' Association, and efforts have been made by that body to secure the permanent preservation of these ancient ruins by Congress. The Thomas Jefferson Memorial Association, which has for its object the building of a suitable memorial to the author of the Declaration

of Independence, is one of the latest of these organizations. Two national bodies have been formed for such work. Of these the American Scenic and Historic Preservation Society is the older. (See SCENIC AND HISTORIC PRESERVATION SOCIETY, AMERICAN.) The National Trust for Places of Historic Interest or Natural Beauty was formed in Washington City, in 1902. Its members were influential in the movement in 1903 that prevented the demolition of the ancient walls of Manila.

PATRIOTS' DAY. The anniversary in the State of Massachusetts of the double battle of Concord and Lexington on April 19, 1775. It was first observed April 19, 1894.

PATRIPASSIANISM (from Lat. *patrius*, relating to a father, from *pater*, father + *passio*, suffering, from *pati*, to suffer, to endure). One variety of Monarchianism, a belief held by many Christians in the West about A.D. 200, according to which Christ and God were so completely identified that the Father himself was said to have suffered and died on the cross. It seems to have originated in the East, but was brought to Rome by Praxeas, late in the second century, and a little later by Noëtus of Smyrna. Its most famous advocate was Sabellius (q.v.), whose name is often used to designate this form of belief (Sabellianism). Tertullian and Hippolytus vigorously attacked the Patripassianists, or Modalists, as they are also called. Largely under the influence of Origen's teaching, the Church rejected modalism, and defined the Catholic doctrine of the Trinity so that it expressed personal distinctions in the Godhead. See ATHANASIUS, and NICEA, COUNCILS OF. Consult: Harnack, *History of Dogma*, vol. ii. (London, 1896); Fisher, *History of Christian Doctrine* (New York, 1896).

PATRISTIC THEOLOGY. The name applied to the teachings of the early Christian writers who are collectively known as Fathers (q.v.) of the Church. They are commonly divided as follows: (1) The Apostolic Fathers. These include Clement of Rome, Polycarp, Ignatius, Barnabas, Hermas, and Papias. (2) The Ante-Nicene Fathers of the second and third centuries, whose work is mainly of an apologetic nature, against Jews on the one hand and Gentiles on the other. Of these the principal names are Justin Martyr, Irenæus, Clement of Alexandria, and Origen in Greek, and Tertullian and Cyprian in Latin. (3) The Nicene Fathers of the fourth century, who set forth the fully developed doctrines of the Trinity and the Incarnation, and defended them against heretics on both sides of the received teachings. They include Eusebius, the historian, Athanasius, Gregory of Nazianzus, Gregory of Nyssa, Cyril of Jerusalem, John Chrysostom, and Epiphanius in Greek, Hilary of Poitiers, and Ambrose in Latin. (4) Classed as Post-Nicene are, in the East, Cyril of Alexandria, Theodoret and John of Damascus; in the West, Jerome, Augustine, Leo the Great, and Gregory the Great. For extended treatment, see the articles under each of these names. From the literary point of view, there is often much to criticise in their works; but the lack of classical elegance and refinement of diction is compensated by the single-hearted fervor and devotion to their cause with which they write.

PATRO'CLUS (Lat., from Gk. Πάτροκλος, *Patroklos*). In Greek legend, a son of Menœtius, and friend of Achilles (q.v.). According to the common story, while yet a boy in Opuntian Locris, he accidentally killed a playmate, and in consequence was brought by his father to Peleus, father of Achilles, at Phthia. With Achilles he went to the Trojan War. Though he was mentioned in the stories of the earlier years of the Trojan War, it is through the *Iliad* that his name has become familiar to us. At the crisis of the battle, when the victorious Trojans had begun to burn the Greek ships, Patroclus persuaded the angry Achilles to allow him to lead the Myrmidons to the rescue. At their head he drove the routed Trojans to their walls, but fell before Apollo and Hector. Over his body raged one of the fiercest struggles of the poem, and it was only when the cry of Achilles struck panic among the Trojans that the Greeks were able to bear it to the ships, where it was mourned in touching verses by Achilles. In later times Patroclus was worshiped as a hero on the Hellespont, where he was believed to be buried with Achilles, and at Opus in Locris.

PATROL (from Fr. *patrouiller*, to patrol, dabble in the water, paw, OF. *patrouiller*, *patouiller*, *patoillier*, to paddle through water, from *patte*, *pate*, paw). In the United States Army, patrols are classified under the following heads: officers; reconnoitring, visiting, covering, or flanking and connecting patrols. Patrols organized for special or extraordinary purposes, are: exploring, harassing, expeditionary, and pursuing patrols. The general duties of patrols are to gain all information possible regarding the enemy, and prevent a similar operation on his side. Other duties are also assigned them, dictated by the specific circumstances of the case. Whenever possible, patrol duty is performed by the cavalry, particularly if the enemy is known to be at a distance. At night, or in close, broken, or wooded country the duty is of necessity performed by infantry—although a few horsemen would if possible be attached for the speedy conveying of information. In the 1901 manœuvres of Germany, France, and Austria, cyclists were found extremely useful as messengers from both cavalry and infantry patrols, wherever the nature of the country admitted of their use; and they are now regularly attached for that purpose. Ordinary patrolling may be performed by any number of men, from three to a company of infantry or a troop of cavalry; a *strong patrol* consists of from 9 to 100 men, and a *small patrol* from 3 to 8 men. *Officers' patrols* consist of from 2 to 10 men, or occasionally of two officers only. They are used in connection with the cavalry screen (q.v.). *Visiting patrols* are a part of outposts (q.v.). *Connecting patrols* are of cavalry, and maintain connection between given points or bodies of troops. *Covering* or *flanking patrols* reconnoitre along the lateral communications, keeping in touch, if possible, with the main body. *Exploring patrols* carry out many of the duties of a topographical reconnaissance (see *Military Surveys*, in the article ENGINEERING, MILITARY) besides their more specific instructions. *Harassing patrols* are assigned the duty of disturbing and annoying the enemy, by depriving him of sleep and rest. *Expeditionary patrols* are sent out to destroy the enemy's

[illegible] roads, railroads, telegraphs, etc., or to [illegible] his patrols or pickets. *Pursuing patrols* hang on the flanks or rear of a retreating enemy—keeping their own troops supplied with information regarding them. On the thoroughness of patrol service largely depends the value to the main body of effective outpost service, or of advance, rear, or flank guards. (See RECONNAISSANCE.) Excellent authorities in regard to this important service are: Shaw, *Elements of Modern Tactics* (11th ed., London, 1900); Wagner, *The Service of Security and Information* (Kansas City, 1896); and Smylie, *Points in Minor Tactics* (New York, 1898).

PATRON (OF., Fr. *patron*, from Lat. *patronus*, protector, from *pater*, father). Among the Romans, originally the appellation of a citizen who had dependents, called clients, attached to him. Before the time of the Laws of the Twelve Tables, the most frequent use of the term *patronus* was in opposition to *libertus*, these two words being used to signify persons who stood to one another in the relation of master and manumitted slave. The Roman was not deprived of all right in his slave when he freed him; a tie remained somewhat like that of parent and child, and the law recognized important obligations on the part of the *libertus* toward his patron, the neglect of which involved severe punishment. In some cases the patron could claim a right to the whole or part of the property of his freedman. The original idea of a patron apart from the manumitter of slaves continued to exist. A Roman citizen, desirous of a protector, might attach himself to a patron, whose client he thenceforward became; and distinguished Romans were sometimes patrons of dependent States or cities, particularly where they had been the means of bringing them into subjection. Thus the Marcelli were patrons of the Sicilians, because Claudius Marcellus had conquered Syracuse and Sicily. The patron was the guardian of his client's interests, public and private; as his legal adviser, he vindicated his rights before the courts of law. The client was bound, on various occasions, to assist the patron with money, as by paying the costs of his suits, contributing to the marriage portions of his daughters, and defraying in part the expenses incurred in the discharge of public functions. Patron and client were under an obligation never to accuse one another; violation of this law was tantamount to treason, and anyone might slay the offender with impunity. As the patron was in the habit of appearing in support of his clients in courts of justice, the word *patronus* acquired, in course of time, the signification of advocate or legal adviser and defender, the client being the party defended; hence the modern relation between counsel and client. Patron, in after times, became a common designation of every protector or powerful promoter of the interests of another; and the saints, who were believed to watch over the interests of particular persons, places, trades, etc., acquired in the Middle Ages the designation of their patron saints. The saint in whose name a church is founded is considered its patron saint.

PATRONAGE (Lat. *patronatium*, homage due a patron, from Lat. *patronus*, protector), ECCLESIASTICAL. The right of presenting a properly qualified person to a vacant ecclesiastical position. Such a right is under many circumstances a species of property that may be enforced in the proper courts of law. The patron originally was the person who founded or endowed the benefice, yet the title came to be applied also to one who succeeded to the right as property. Proprietors of lands were early encouraged to build and endow churches on their own possessions. In such cases the priest in charge did not look to the bishop for his support, but was allowed to receive the whole or a part of the profits of the lands with which the founder had endowed the church. Eventually it came to be stipulated with the bishop that the founder and his heirs should have a share in the administration of the property and have the right to nominate a person in holy orders to be the incumbent whenever a vacancy occurred. The person enjoying the privileges of a founder was called *patronus* and *advocatus*. He had a prominent seat and a burial place in the church; his name and arms were engraved on the church, and on the church walls, and he was specially named in the public prayers. He sometimes also had a right to a portion of the church funds, called *patronagium*.

In France the right of patronage was often extended by the sovereigns to churches not originally private foundations. Church property was bestowed in fee on laymen, who appropriated the greater part of the revenues, and took the appointment of the clergy into their own hands. It was at last ruled by the third and fourth Lateran councils (1179 and 1215) that the presentation of the patron should not of itself suffice to confer any ecclesiastical benefice when the presentee was a layman.

Toward the close of the twelfth century letters of request began to be issued by the popes to patrons that benefices should be bestowed upon particular persons. What had at first been requested as a favor was soon demanded as a right. In the thirteenth century the patronage of all livings whose incumbents had died at the court of Rome (*vacantia in curia*) was also claimed by the Pope. By the fourteenth century these claims encountered effective opposition. England took the lead in a resistance which was in the end successful. In Scotland, at the time of the Reformation, the rights of patrons were reserved and the presbyteries were bound by several statutes to admit any qualified person presented by the patron. For three centuries the question of lay patronage was a cause of contention, legislation, and litigation, but by an act of Parliament passed in 1874 patronage in Scotland was abolished, and the right of choosing their minister transferred to the congregation. Upon the Continent of Europe, in the Protestant churches of Germany, Denmark, Sweden, and Norway, ecclesiastical patronage exists to some extent. The only form of ecclesiastical patronage to be found in the United States is that in the hands of the bishops of the Roman Catholic Church. With these rights the decrees of the plenary councils of Baltimore have dealt upon the general principles laid down by the canons of the third and fourth Lateran councils.

PATRONS OF HUSBANDRY. See GRANGE.

PATRONYMIC (Lat. *patronymicus*, from Gk. πατρωνυμικός, *patrōnymikos*, relating to one's

father's name, from *πατήρ, patēr*, father + *ὄνομα, onoma*, name). Properly a name taken from one's father, but generally applied to such names as express descent from a parent or ancestor. In Sanskrit, Greek, and Latin patronymics are very numerous. They may be derived from the name of a father, mother, grandfather, or remoter ancestor, as Atrides, son of Atreus; Æacides, grandson of Æacus. The names of the founders of nations have also been used to form a sort of patronymic, as when the Romans were called Romulidæ. A number of the surnames in use in modern times are patronymics, as Johnson, the son of John. Originally these names fluctuated from generation to generation, as was the case in Shetland, where Magnus Johnson's son called himself John Magnusson or Manson. In the course of time it was generally found more convenient to take a surname from one well-known ancestor, which should descend unchanged to the children of the bearer of it.

PATROONS' (Dutch *patroon*, protector, patron, from Lat. *patronus*, protector). The name applied to a special class of settlers in the New Netherlands. In 1629, in order to facilitate emigration to America, the Dutch West India Company granted certain 'freedoms and exemptions' to such of their number as, within a period of four years after having given due notice, should plant a colony of fifty persons over fifteen years of age in the New Netherlands. Such men were to be called patroons (or patrons) and each was to have as his 'absolute property' a tract of land extending 16 miles along any navigable river (or eight miles if on each shore) and "so far into the country as the situation of the occupiers will permit." The proprietors were, besides, invested with many feudal privileges, being empowered to hold both civil and criminal courts, to appoint local officers and magistrates, and to punish offenders against the law, except in certain specified cases, where there existed a right of appeal to the Director-General at Fort Amsterdam. In practice, however, this right was virtually abrogated. The settlers were to be exempt from taxes for ten years, but were to be absolutely bound to their patroon for a specified period, and were to pay certain rentals, either in money or in kind. Schools and churches were to be established, but at the same time slavery was introduced, commerce was restricted, and manufacturing was prohibited on pain of banishment. Several patroonships were soon established, the largest (and the first) being Rensselaerswyck, which remained in the Rensselaer family until about the middle of the nineteenth century. In 1640 a new charter of 'freedoms and exemptions' was granted, by which patroonship privileges were extended to "all good inhabitants of the Netherlands," the period of settlement limited to three years, the prohibition of manufacturing rescinded, and the size of the grants limited to four miles along a coast and eight miles into the interior. At the same time many inducements were offered to smaller landholders, called masters or 'colonists.' The system gave New York one of its characteristic features throughout the colonial period, creating as it did a landed aristocracy, fostering class divisions and semi-feudal relations between landholder and tenant, and discouraging the immigration of settlers, who naturally preferred to obtain land in fee simple in other colonies rather than become tenants of proprietors in New York. Under the English régime the system remained virtually unchanged, but in 1775 some of its chief features were abolished, and the patroons or 'lords of the manor' became mere proprietors of estates. Many characteristics of the old feudal tenure, however, remained, and the relations between tenant and landlord became more and more strained, until a modification was effected by the Anti-Rent agitation of 1839-47. See ANTI-RENTISM.

PATTAN, pä-tän'. A town of India. See PATAN.

PATTÉ, pá'tā' (OF. *patte*, broad-footed, from *patte*, paw). A term in heraldry (q.v.) applied to a cross with its arms expanding toward the ends and flat at their outer edges.

PAT'TEN, SIMON NELSON (1852—). An American economist, born at Sandwich, Ill. He was educated at Jennings's Seminary (Ill.), Northwestern University (Ill.), and at the University of Halle, Germany, and received the degree of Ph.D. in 1878. During the next ten years he taught in the public schools of Iowa and Illinois. In 1888 he was elected professor of political economy at the University of Pennsylvania. His principal works are: *Premises of Political Economy* (1885); *The Consumption of Wealth* (1889); *The Economic Basis of Protection* (1890); *The Theory of Dynamic Economics* (1893); *The Theory of Social Forces* (1896); *Development of English Thought* (1899); *The Theory of Prosperity* (1901); *Heredity and Social Progress* (1903). Professor Patten ranks as one of the most brilliant and original of American economic writers. His chief contributions to economics are his analyses of dynamic forces in economic life, of monopoly elements in value, and of the bearing of the laws of consumption upon distribution. A large part of his work is rather sociological than economic.

PAT'TERSON, CARLILE POLLOCK (1816-81). An American civil engineer, superintendent of the United States Coast Survey, born at Shieldsboro, Mass. He was appointed midshipman in 1830, served in the Mediterranean squadron, and, after graduation at Georgetown College as a civil engineer in 1838, was attached to the Coast Survey (1838-41). In 1845 he led a hydrographic expedition to the Gulf of Mexico; from 1850 to 1861 commanded the Pacific mail-steamer *Oregon*; in 1861 was appointed hydrographic inspector in the United States Coast Survey, and in 1874 superintendent. This department was greatly developed by him.

PATTERSON, DANIEL TOD (1786-1839). An American naval officer, born on Long Island, N. Y. He entered the navy in 1800, and was on board the frigate *Philadelphia* in the expedition commanded by Capt. William Bainbridge when the frigate ran upon the rocks off the coast of Tripoli, and the entire crew were held prisoners until peace was declared. In 1813 he was promoted to be commander. In September, 1814, he commanded the expedition which broke up the establishment of the pirate Lafitte in Barataria Bay. He was made captain in 1815; commanded the frigate *Constitution* from 1826 to 1828; and in the latter year was appointed navy commissioner. In 1832-36 he commanded the Mediterranean squadron, and on his return was

[illegible] at the navy yard at Washington [illegible] until his death.

PATTERSON (BONAPARTE), ELIZABETH (1785-1879). An American woman, famous as the wife of Jerome Bonaparte. She was born in Baltimore, Md., and was the daughter of William Patterson, one of the wealthiest men in the United States. When Jerome Bonaparte visited Baltimore in 1803 he was fascinated by Miss Patterson and the two were married by Bishop Carroll, December 24, 1803. In April, 1804, Napoleon, through M. Pichon, Consul-General of France, in New York, declared the marriage illegal, and ordered Jerome to return to France and to leave the 'young person' behind. The other members of his family, however, accepted the situation and promised to receive her. In 1805 Jerome and his wife sailed for Europe. The latter, not being allowed to land either at Lisbon or Amsterdam, went to England, and her son, Jerome Napoleon, was born at Camberwell, July 7, 1805. Meanwhile Napoleon had requested unsuccessfully the annulment of the marriage from Pope Pius VII., but the Council of State granted the divorce. In November Madame Bonaparte returned to the United States, and lived with her father. After the battle of Waterloo she went to Europe, where she was well received in the most exclusive circles, and was much admired for her beauty and wit. In 1815, by special act of the Legislature of Maryland, she secured a divorce. From 1816 to 1819 she was in Baltimore, and subsequently spent much of her time in Europe. Her last years were spent in Baltimore in the management of her estate, which she increased to more than a million and a half. Consult Didier, *Life and Letters of Madame Bonaparte* (New York, 1879).

PATTERSON, ROBERT (1743-1824). An American educator, and director of the mint. He was born near Hillsborough, County Down, Ireland, emigrated to the United States in 1768, and lived for a time in Philadelphia. In 1774 he became principal of an academy in Wilmington, Del. In the disputes between the colonies and the British Ministry he allied himself with the Whig or Patriot Party, and in the early part of the Revolutionary War served as assistant surgeon and brigadier-major in the Continental Army. From 1779 to 1814 he was professor of mathematics in the University of Pennsylvania, being also from 1810 to 1813 vice-provost. In 1805 President Jefferson appointed him director of the mint, which position he held until a short time before his death. Always actively interested in the American Philosophical Society, he was its president from 1819 until his death. He published *The Nocturnal Sustra* (1808) and edited various works.

PATTERSON, ROBERT (1753-1827). An American pioneer, born in Pennsylvania. He emigrated to Kentucky in 1775. In October, 1776, on a trip to Fort Pitt to secure ammunition, his party was attacked by Indians and every member was killed or wounded. He took part in Col. George R. Clark's successful expedition against Kaskaskia and Vincennes in 1778, and in Capt. John Bowman's attack on Chillicothe in 1779. In April, 1779, he built a blockhouse on the present site of Louisville, Ky. In 1780 he was a captain in Colonel Clark's expedition against the Shawnees, and in 1782 was second in command under Boone at [illegible] Blue Lick. He was a colonel in Clark's second expedition into the Miami country this year, and served with Gen. Benjamin Logan's expedition against the Shawnees in 1786, in which he was severely wounded. He, with two companions, bought from John Cleves Symmes a tract of 740 acres of land opposite the mouth of the Licking River, and founded, in 1788, the town of Losantiville, now Cincinnati. He sold his interest in 1794, and in 1804 settled in Dayton, Ohio, where he lived until his death.

PATTERSON, ROBERT (1792-1881). An American soldier, born at Cappagh, County Tyrone, Ireland. About 1798 he emigrated to the United States, and finally settled in Philadelphia. During the War of 1812 he was assistant deputy quartermaster-general, with rank of captain, from 1813 to 1814, and in 1814 was appointed captain of the Thirty-second Infantry. He was commissioned major-general of volunteers in 1846, and in the Mexican War commanded a division at Cerro Gordo, directed the pursuit of the retreating Mexicans by the cavalry and leading infantry brigades, and occupied Jalapa. Under President Lincoln's three-months call for troops (April 15, 1861) he was appointed by Governor Curtin, of Pennsylvania, major-general of volunteers, organized the three-months forces in Philadelphia, and later commanded the Department of Pennsylvania. When McDowell began his march against Beauregard, Patterson was instructed to detain Johnston and prevent him from supplying Beauregard with reenforcements. This, however, he failed to accomplish. He withdrew to Charleston, about 18 miles from Winchester, and Johnston's entire force arrived in time to take part in and determine the result of the first battle of Bull Run. A long controversy ensued as to the responsibility for this event, and Patterson was vigorously criticised in some quarters. He published a vindication entitled *A Narrative of the Campaign in the Valley of the Shenandoah in 1861* (1865). Patterson was mustered out on July 27th. He invested largely in the sugar and cotton industries, and was among the leading American mill-owners.

PATTERSON, WILLIAM MCKENDREE (1838-88). A missionary of the Methodist Episcopal Church, South. He was born near Saint Louis, Mo., graduated at Saint Charles College, 1860, and entered the Saint Louis Conference in 1861. He was chaplain in the Confederate Army, 1862; agent for the American Bible Society, 1865; agent for Vanderbilt University, 1872; missionary to Mexico, 1872-88. Part of the time he edited *Mexican Evangelista*. In 1888 he became agent for the American Bible Society in Venezuela, but died of yellow fever in Caracas a few days after his arrival in the country.

PATTESON, JOHN COLERIDGE (1827-71). An English divine, Bishop of Melanesia. He was born in London, was educated at Ottery Saint Mary, at Eton, and at Balliol College, Oxford. He obtained a fellowship at Merton, went to Dresden to study German, and was ordained in 1853 to the curacy of Alfington, near Ottery Saint Mary. In 1855 he left England with Bishop Selwyn of New Zealand to enter upon a missionary career. His first work was instructing boys of the Melanesian Islands, and when the mission was regularly established there

he was, in 1861, consecrated bishop, and fixed his residence at Mota. He spoke as many as twenty-three of the native dialects, and made translations of parts of the Bible into the Mota tongue, which he regarded as the most typical. He worked for twenty years in the Islands and made great improvements in the material and spiritual condition of the natives. His position was rendered difficult by the action of British traders who sometimes used the Bishop's name to further the kidnapping of natives to be either enslaved or held as laborers upon the plantations of Fiji and Queensland. In revenge for such an outrage against the islanders of Nakapu, the Bishop himself was slain by the natives. Consult his *Life* by Charlotte M. Yonge (London, 1878); also Awdry, *The Story of a Fellow Soldier* (London, 1875).

PATTI, pät'tē. A town in the Province of Messina, Sicily, situated on the north coast, 35 miles west by south of Messina by rail (Map: Italy, J 9). Its cathedral contains the tomb of Adelasia, mother of King Roger II. of Sicily. The town has silk mills, sandstone quarries, and a shipping trade in olive oil, flour, and fish. Population (commune), in 1881, 9374; in 1901, 11,082.

PATTI, ADELINA (1843—). A celebrated operatic singer of Italian parentage, born at Madrid. When about ten years of age she appeared in a series of concerts with Ole Bull and Maurice Strakosch. After a course of professional study, she made her first operatic appearance (1859) in New York. Her real début, which occurred in London, took place in 1861, when she appeared as 'Amina' in *La Sonnambula;* after which she was acknowledged one of the greatest artists of her day. Her voice was an unusually high soprano, of rich, bell-like quality, and remarkable evenness of tone; to these qualities she added purity of style and high artistic finish. Equally at home in the portrayal of deep passion and the sprightly vivacity of light comedy, she was also conspicuously successful in oratorio. She was as popular throughout Continental Europe as in England and America. In May, 1868, she married the Marquis de Caux, from whom she was divorced in 1885. In 1886 she married Ernesto Nicolini, a well-known tenor, who died in 1898. In 1899 she married Baron Cederström, a Swedish nobleman. She resides in Wales, where she is the owner of a magnificent castle. After about 1890 she confined herself almost entirely to the concert platform.

PATTI (DEMUNCK), CARLOTTA (1840-89). An Italian vocalist, sister of Adelina. She was born in Florence, of musical parents, who were also her first teachers in singing. She afterwards studied the piano under Henri Herz at Paris. Her voice was a soprano of unusual compass, and of a clear silvery quality, and much power in the upper register; a slight degree of lameness, however, prevented her from appearing in opera. Her peculiarly sweet high notes brought her into favor with the public. She made her début in New York in 1861, where for some years previously she had made her home. She became very popular throughout America as a concert soprano, and was almost as successful in Europe, her first appearance there occurring in 1863, in London. Like her sister, she was a brilliant coloratura vocalist. She married De Munck, a violoncellist, in 1871. She died in Paris.

PAT'TISON, DOROTHY WYNDLOW (1832-78). Better known as SISTER DORA. A famous nurse, sister of Mark Pattison (q.v.). She was born at Hawkswell, near Richmond, Yorkshire. In 1864 she joined a sisterhood of the Church of England (the Sisterhood of the Good Samaritan), and early in the following year became a nurse in a cottage hospital at Walsall. In 1867 a new hospital was built, of which she had sole charge until 1877, when she resigned to become head of the municipal hospital in the same place. She had many natural gifts for her work, acquired much skill in surgery, and was tireless in philanthropic labors. Her life has been written by Margaret Lonsdale (London, 1880).

PATTISON, MARK (1813-84). An English scholar and writer, born at Hawkswell, Yorkshire. He was educated at Oriel College, Oxford (B.A., 1836; M.A., 1840). He translated the "Saint Matthew" from Thomas Aquinas's *Catena Aurea* on the Gospels for Newman (written, 1839; printed, 1842), and also contributed biographies of Stephen Langton and Saint Edmund to the series of lives of English saints published under Newman's editorship. In 1839 he was elected fellow of Lincoln, and in 1843 was ordained priest. He was appointed to a tutorship of Lincoln in 1843, and in 1848 became examiner in the school of *litera humaniores*. In 1853 he was again appointed examiner, and in 1855 resigned his tutorship. He was then for a time a private tutor at Oxford, but later was much in Germany. In 1861 he was elected rector of Lincoln. He also became a curator of the Bodleian Library and of the Taylor Institution. From 1845 his theological views greatly changed; he wrote for the *Essays and Reviews* (1860) an article on "Tendencies of Religious Thought in England, 1688-1750," intended as "a neutral and philosophic inquiry," and so recognized on the Continent, but not in England; and he remained a liberal member of the Anglican communion. His principal studies, however, were not theological or philosophical, but were directed originally to the preparation of a history of learning from the time of the Renaissance, and later to that of the more restricted account of the French school of philology. Of this work only fragments were executed, most important of which is the *Life of Isaac Casaubon* (1875; 2d ed. 1892). Other portions appear in the selected *Essays* (2 vols., 1889), edited by H. Nettleship. He also wrote an excellent *Life of John Milton* (1879; reprinted, with alterations, 1880, 1883, 1885, 1887) for the "English Men of Letters" series, and edited Pope's *Essay on Man* (1869; 2d ed. 1872) and *Satires and Epistles* (1872; 2d ed. 1874). An edition by him of the *Sonnets* of Milton, with a valuable introduction, appeared in 1883. Other published volumes are *Sermons* (1885), and the *Memoirs* (to 1861), dictated in 1883, and printed in 1885. Pattison's literary work is for the main part marked by the most thorough scholarship, eminent judgment, and a skillful presentation of material. In real academic distinction he was second to none at Oxford. He was a tireless pedestrian and angler, a student of natural history, brief and often ironic in speech, contemptuous of

[illegible] reticent in the expression of his [illegible] sometimes quite to hamper the proceedings [illegible] committees of which he was a member.

PATTISON, Robert Emory (1850—). An American politician, born at Quantico, Somerset County, Md. When he was six years old his parents removed to Philadelphia, where he was educated in the public schools, and in 1872 was admitted to the bar. Five years later he was elected city Comptroller and discharged his duties with exceptional efficiency. He was reëlected, though a candidate on the otherwise unsuccessful Democratic ticket. In 1882 his party nominated him for Governor, and he was elected by a plurality of more than 40,000, the first Democrat to hold the office in thirty years. His administration was characterized by the same energy and probity that he had shown as Comptroller. In 1890 he was again elected Governor.

PATTISON, Robert Everett (1800-74). An American clergyman and educator. He was born at Benson, Vt., and educated at Amherst College. He was ordained to the Baptist ministry in 1829, and the next year accepted a call from the First Baptist Church, Providence, R. I. In 1836 he became president of Waterville College (now Colby College), and remained until the college was obliged to suspend in 1840 from a lack of funds. He resumed preaching, and in 1843 became corresponding secretary of the Baptist Board of Foreign Missions. In 1845 he became president of the Western Baptist Theological Institute, Covington, Ky.; but he resigned in 1848 and accepted the chair of systematic theology in Newton Theological Seminary. Waterville College having reopened its doors in 1841, Dr. Pattison was again made its president in 1853, but resigned five years later on account of ill health. He was subsequently professor of systematic theology in Shurtleff College, professor of theology in the Baptist Theological Seminary, Chicago, and vice-president and professor of moral and intellectual philosophy in Chicago University. He died at Saint Louis, Mo. His one published work is the *Commentary on the Epistle to the Ephesians* (1850).

PAT'TON, Francis Landey (1843—). An American clergyman and educator. He was born at Warwick, Bermuda. He studied at Knox College, of the University of Toronto, and at Princeton Seminary, New Jersey. He was ordained to the ministry in 1865, and after holding several pastorates was, in 1871, appointed professor of didactic and polemical theology in the Theological Seminary of the Northwest (now McCormick Seminary, Chicago), where he remained ten years. During the period from 1873 to 1876 he edited the religious journal *The Interior* (Chicago), in which connection he brought charges of heresy against Prof. David Swing, resulting in the latter's trial and subsequent withdrawal from the Church. While in Chicago, he also held the pastorate of the Jefferson Park Presbyterian Church, and in 1878 was elected moderator of the Presbyterian General Assembly. In 1881 he assumed the professorship endowed for him in Princeton Theological Seminary, styled the chair of the relations of philosophy and science to the Christian religion; in 1885 he became professor of ethics in the college, and in 1888 succeeded James McCosh in the presidency. In 1891 and 1892 he was again prominent as an opponent of the so-called heretical views of Dr. C. A. Briggs, of Union Theological Seminary. In 1902 he resigned from the presidency of Princeton University, but was soon after elected to that of the seminary. His administration of Princeton was marked by the assumption of the title Princeton University in place of the charter name, 'The College of New Jersey,' and by large donations which enabled the university to make extensive additions to its equipment and buildings. The number of students nearly doubled during this period from 1888 to 1902, and new courses were added to both the scientific and academic departments. Perhaps most important in the future development of Princeton as a university was the founding of a graduate school. President Patton became widely known as a forcible speaker and a keen, logical thinker on theological subjects. He contributed frequently to leading periodicals and wrote *Inspiration of the Scriptures* (1869), and *Summary of Christian Doctrine* (1874).

PATUX'ENT. A river of Maryland, rising in Frederick County, and flowing southeastward into Chesapeake Bay north of the Potomac (Map: Maryland, L 5). It is 90 miles long, and for the last 40 miles it is a navigable tidal estuary abounding in valuable oyster beds.

PÁTZCUARO, päts'kwä-rō. A town of Mexico in the State of Michoacán, situated on the south shore of the beautiful Lake Pátzcuaro, 38 miles southwest of Morelia (Map: Mexico, H 8). It is irregularly built, with narrow, crooked streets, but is very picturesque in appearance, being surmounted by a church built on the top of a high hill. It is noted for the manufacture of fine furniture and beautiful featherwork. Population, in 1895, 7082. Pátzcuaro is supposed to have been the ancient capital of the Tarasca Indians.

PATZUM, pät-thōōm'. A town of the Department of Chimaltenango, Guatemala, 33 miles west of the city of that name. The chief industry is wool-weaving, and in the vicinity sugarcane, grain, and coffee are produced in abundance. Mines of silver, antimony, lead, and coal are found near by. Its population in 1892 was about 6500.

PAU, pō. The capital of the Department of Basses-Pyrénées, France, on the Gave de Pau, 105 miles south-southeast of Bordeaux (Map: France, F 8). It occupies a rocky height, cloven in two by a ravine and united by a high bridge. Toward the south it commands magnificent views of the western Pyrenees. Among its chief buildings are the two Gothic churches of Saint Martin and Saint James, a palace of justice, a beautiful theatre, museum, a public library containing over 55,000 volumes, and a winter palace built in 1896 in Beaumont Park. The Château of Henry IV., erected in the fourteenth century on the site of an older castle, dominates the town and contains interesting memorials of the kings of Navarre. A striking marble statue of Henry IV. stands on the Place Royale in the centre of the town. There are linen and cloth manufactures, and a trade in Jurançon wine, grain, marble, and leather. Many swine are fed in the vicinity, and from the pork the famous *jambons de Bayonne* are made. Pau is a favorite resort of the English, especially during the winter, and is a general rendezvous for those who wish to

explore the Pyrenees. Population, in 1891, 33,111; in 1901, 34,268. Founded in the tenth century, Pau became important as the residence of the sovereigns of Navarre in the fifteenth century.

PAUER, pou'ẽr, ERNST (1826—). An Austrian-English pianist and writer on music, born at Vienna. He studied there with Dirzka, Sechter, and the son of Mozart, and at Munich with Lachner. He directed musical societies in Mainz from 1847 until 1851, when he went to London, but did not sever his Continental connections, and gave concerts in Germany and elsewhere. He became a professor at the London Royal Academy of Music in 1859 and was made Austrian Court pianist in 1866. In 1867 he was made principal professor in the National Training School, and from 1883 to 1896 held a similar position at the Royal College of Music. He was appointed musical examiner at Cambridge in 1879. From 1870 he gave musical lectures throughout Great Britain upon the history of music and kindred subjects, with pianoforte illustrations. He fathered German music in London and to the Augener editions he contributed *Old English Composers for the Virginal and Harpsichord*, as well as the Bach, Handel, Schumann, and other classical and romantic selections. Some of his own studies are included in the series of one hundred called *The New Gradus ad Parnassum*, which he published. His compositions include besides three operas, a symphony, quartette, quintette, songs, and pianoforte solos.

PAUL. The Apostle of Jesus Christ who was specially commissioned to work among the Gentiles. The sources from which we secure our knowledge of his life and work are his own Epistles and the Book of Acts. From these it is clear that the condition of the Church when he came to the full prosecution of his work was one which rendered that work not only most significant for the future development of the Church, but most revolutionary to the ideas which the Church's leaders entertained as to what that development should be. These leaders were the Apostles who had formed the nucleus of Jesus's discipleship during His ministry on earth. They were men of limited education, and with no great breadth of religious ideas. As a consequence their views of the necessary development of Jesus's religion practically restricted it to a reforming of Judaism in accordance with Jesus's teaching, and as this reformed Judaism went out in a new evangelism to the world, it involved the bringing of the world into this religion through the gateway of Judaism. In view of their Palestinian training and experience, these views were perfectly natural for the Apostles to entertain; but they were also clearly impossible for the Church to carry out, if the religion of Jesus was to realize for itself that world-wide development which the Gospels show us Jesus himself intended it should have. It was at this latter point that Paul through his work and teaching introduced into the Church new conceptions which virtually revolutionized its ideas and made possible for Christianity its development as a universal religion.

Paul's early name was Saul; he was a native of Tarsus, in the Province of Cilicia (Acts xxi. 39), where he was born about the beginning of the Christian Era. His parents were Jews (Acts xxiii. 6; II. Cor. xi. 22). His early training was doubtless that of the ordinary Jewish boy, though it was apparently at an early age that he was sent to Jerusalem to be educated in the Rabbinic schools of that city, having as his teacher in the sacred law the liberal-minded Gamaliel (Acts xxii. 3; see GAMALIEL). According to his own testimony he threw his whole heart into all that was taught him there, becoming one of the straitest of the sect of the Pharisees, and having no conception beyond that of a salvation to be obtained through a perfect performance of the works of the Law (Gal. i. 14; Acts xxii. 3; xxvi. 4-5; Phil. iii. 4-6).

After his Rabbinic training he returned for a while to his native city, in order to learn his trade (Acts xviii. 3). While there he may possibly have supplemented his Jewish education by attendance upon the Gentile schools, for which Tarsus was famed. From Cilicia he came back to Jerusalem, where he became prominent in ecclesiastical affairs, being apparently chosen to membership in the Sanhedrin (Acts xxvi. 10). Though in Jerusalem for some time, it is not probable that he was there during the time of Jesus's ministry, for he does not seem to have ever seen the Great Teacher. He was, however, well acquainted with Jesus's Messianic claims and was clearly conscious of the opposition to Judaism which they involved. Consequently, when, after the Day of Pentecost, this new discipleship began to assume large proportions, and take to itself a definitely organized form, he shared in the bitter hostility to the movement which animated the religious leaders of the people. Into the persecution which this produced he threw himself with energy, participating practically in the death of Stephen (Acts vii. 58; viii. 1), and following up this assault with a rigor of inquisition that made him conspicuous among his fellows (Acts xxii. 4; xxvi. 9-11; Gal. i. 13-14). In the year 34 or 35, however, while on a journey to Damascus undertaken for the purpose of searching out the disciples in that place and bringing them bound to Jerusalem, he went through the experience of a supernatural vision that brought him to his journey's end under the deep conviction of the sinfulness of the course he was pursuing (Acts ix. 1-9). Out of this state of soul he came a Christian disciple, profoundly convinced of the Messiahship of Jesus, and distinctly conscious of having received from his Master a commission to preach His religion among the nations of the earth (Acts ix. 10-18; Gal. i. 15-16).

This mission, however, he did not immediately carry out, but for the greater part of three years withdrew into the region of Arabia (Gal. i. 17). The purpose of this withdrawal it may not be possible definitely to determine, though, from the contrast in which he places it to the alternative course of conference with the Apostles at Jerusalem, it would seem that primarily it was for the sake of meditative thought upon the spiritual revolution which had taken place in his life. At the same time, it cannot be doubted that he availed himself of such opportunity of practical work as the region afforded (Gal. i. 15-23).

Upon his return to Damascus and Jerusalem he began to preach his new-found faith, evidently with some fuller conception of the Gentile direc-

tion of his mission than he had had immediately after his conversion (Acts ix. 19-22), especially in Jerusalem, where he singled out the Greek-speaking Jews, disputing with them, doubtless largely along the lines of the Messiahship of Jesus (Acts, ix. 28-29; xxii. 18). His motive in making Jerusalem the place of his preaching was apparently the courageous one of returning to the scene of his former work of persecution, and bearing open testimony to Jesus before those with whom he had formerly been associated. That this, however, was not what the Master intended him to do is clear from the fact that while in Jerusalem he was made conscious through a vision that he was to leave the city and give himself to work among the more distant Gentiles (Acts xxii. 17-20).

In obedience to this command, he went to his home in Cilicia, visiting on the way the regions of Syria, where in all probability he accomplished some work of a Gentile character in the city of Antioch. Such a hypothesis at least explains the reason for the statement that refugees from the Stephen persecution in Jerusalem coming to Antioch changed the character of their ministry and preached the word to those who were not pure Jews (Acts xi. 19-20), and that, upon the successful outcome of their preaching, Paul was summoned from Tarsus to give his aid and assistance in the development of this new movement (Acts xi. 21-26).

Antioch became thus the place of Paul's labors, and here his ministry gradually reached the full Gentile character which the Master had intended it should have, resulting finally, under divine direction, in the sending out of Paul and Barnabas to the neighboring Gentile regions of Asia Minor (Acts xiii. 1-3). The remarkable success of this mission brought Paul at last to a consciousness of the full meaning of his Gentile commission (Acts xiii. 44-48), and also brought the Church to a full realization of the significance of this new departure. In fact, upon their return to Antioch, Paul and Barnabas were confronted with a grave and serious dispute. Parties representing the extreme Jewish element in the Mother Church came to Antioch insisting upon the need of circumcision in order to salvation. This was so contrary to Paul's fundamental conception of salvation by faith that surrender was impossible, and under the advice of the local Church the controversy was carried up to Jerusalem for submission to the Apostles and Elders there (Acts xv. 1-2). A clear understanding of the resultant council and the position in it of Paul and Barnabas on the one side, and the leaders of the Church on the other, can only be secured by recognizing the development through which Paul's work had gone from his own original conception of it, and especially from the original conception of it held by the Jerusalem Church. That Paul had the fundamentals of his theology from the time of his conversion may be accepted, as far as our records give any light; that these fundamentals included a clear conviction of the principles of justification by faith is almost necessary, if Paul's theology is to be understood as in any sense self consistent—for this principle is practically essential to his thinking. But while Paul may have possessed the principle of his theology from the beginning, it is manifestly clear that the practical experiences of his work had an effect upon the application which he gave to these principles. Few greater experiences, however, did he go through in his work than that of the wholesale conversion of the Gentiles during his first mission tour. That these experiences must have given strength to his conviction of justification by faith is of course very clear; but it is also clear that it must have widely broadened the application of that principle in the direction of the universalizing of the Gospel beyond the bounds of Judaism. If, however, such was the influence of this experience upon Paul's own views, its effect upon the slower and more conservative views of the Jerusalem Church must have been even more significant. That Paul told them fully of his commission to a Gentile work at his first visit to the city after his conversion may not be doubted; that they fairly understood his position, and frankly accepted it, would seem to be clear from the companionship with them into which the records show him to have entered; but if Paul himself at that time had but an undeveloped view of all his theology meant in the direction of a justification by faith, much less developed must have been the views on this point of those in the Jerusalem Church. It may be safely said that their conception of and agreement to Paul's position was largely theoretical until the results of this first mission tour startled them into a realization of the full significance of his commission. Treasuring as they did the Jewish origin of Jesus's religion and the Jewish character of his discipleship, this wholesale ingathering of the uncircumcised Gentiles naturally seemed to them to herald the doom of the Church.

From such a situation it was inevitable that there should come dispute and controversy. The extremists on the side of the Jerusalem Church insisted on circumcision—the distinctive feature of ceremonial Judaism—as necessary to salvation and acceptance within the Church. Paul and his followers insisted on the freedom from this rite given by the essential principle of justification by faith. It was the determination of this contention, in the light of the practical results of the first mission tour, that constituted the real question before the Jerusalem Council; and the decision which was reached to grant the Gentiles, with a few unessential provisos, full freedom from the ceremonial law was a result which was not only a triumph for the views of Paul, but a salvation for the Church itself. For, in spite of the conviction of the Jerusalem leaders, the Church's future lay beyond Judaism, and could be reached only as the way to Christ was no longer obstructed by the forms which Judaism imposed.

From this council Paul and Barnabas returned to Antioch, and soon afterwards Paul, having disagreed with Barnabas on some matters of their practical work, took with him Silas, who had come down with them from Jerusalem, and started upon his second missionary tour (Acts xv. 30-40). On this tour he first revisited the churches established at an earlier period in Syria and Cilicia, as well as those gathered together on his first journey. From one of these latter churches he secured Timothy to be a helper in his work. Upon arriving finally at Antioch in Pisidia he essayed to go farther westward into the Province of Asia, but, being divinely forbidden, he returned northward with a view ulti-

mately of entering the Province of Bithynia, but, again, being forbidden by the Holy Spirit, he turned westward to the seacoast town of Troas, the old classical region of Troy (Acts xv. 41-xvi. 8).

It is clear from his general policy of selecting the large city centres for his work that Paul's purpose in this further extension of his journey beyond Antioch had been to go to Ephesus and, when forbidden to preach there, to go northward to Byzantium, which at that time was within the Province of Bithynia. The divine prevention of this policy, confusing though it was, left him naturally convinced that the Master had for him some distinctive mission to perform. He was consequently in a receptive mood for the vision which came to him at Troas and called him across the water to Thrace.

In obedience to this divine direction he entered upon his first European mission, passing down along the commercial highway that gave him entrance at the important towns of Philippi, Thessalonica, and Berea and finally brought him to Athens and Corinth (Acts xvi. 9-xviii. 1). At all of these places, as far as Corinth, his mission efforts had been disappointing, either being broken off by persecution or being received with indifference and contempt. As a consequence he came at last to Corinth in a despondent frame of mind (I. Cor. ii. 3). At this last place, however, his work was greatly blessed, and for a year and a half he and his companions remained in that region establishing churches, not only in Corinth itself, but throughout the Province of Achaia (Acts xviii. 2-11; II. Cor. i. 1). It was during the early part of his stay in Corinth that, anxious for their welfare in the face of persecution, corrupting influences, and false teachings, he wrote his two letters to the Thessalonians, generally considered the earliest of his preserved writings. (See THESSALONIANS, EPISTLES TO THE.) From Corinth Paul returned by sea to Syria, stopping on the voyage at Ephesus long enough to reason in the synagogue and make promise of a return for more extended work. Landing finally at Cæsarea, he went up to Jerusalem with greetings to the Church, and then returned to Antioch (Acts xviii. 18-22).

After some time spent there he set out upon his third mission tour, visiting again the churches of Southern Asia Minor, and in fulfillment of his promise proceeded on to Ephesus. At this large centre of activity and influence he remained at work for the greater part of three years, carrying the Gospel, either personally or through his helpers, throughout the entire seacoast Province of Asia (Acts xviii. 23-xix. 20; xx. 17-35; I. Cor. xvi. 19). During this period he was in more or less contact with the Church at Corinth, whose problems of organization, Christian brotherhood, and moral life necessitated frequent communication with the Apostle. This produced considerable correspondence, portions of which are preserved in his Corinthian Epistles. It is quite clear that late in this period, in answer to an urgent summons, he made a hurried trip from Ephesus to Corinth by the direct route across the sea. The occasion of the visit was evidently a new manifestation of factional tendencies in the Church. The visit was apparently quite brief, and resulted in a practical failure to straighten out the situation. (See CORINTHIANS, EPISTLES TO THE.) Soon after his return to Ephesus from this fruitless trip Paul was obliged to leave the city, because of disturbances occasioned by pagan resentment of his increasingly successful work. To give himself and the people at Corinth time to recover from the disappointing experiences of his recent visit, as well as to visit the Macedonian churches established on his previous journey, he selected the less direct route by the way of Troas (Acts xix. 23-xx. 1; II. Cor. i. 23-ii. 13). On the way he again wrote to the Corinthians and engaged in more or less mission work in the provinces south of Macedonia, covering the territory up to if not across the borders of Illyricum. It is quite likely that during the progress of this work he received the startling news from the Galatian churches which occasioned his letter to them. (See GALATIANS, EPISTLE TO THE.) Reaching Corinth in the late autumn or early winter of the year 55, he remained there three months (Acts xx. 1-3). During this time he wrote his letter to the Church at Rome—a church he had not founded or seen, but to the visiting of which he looked forward with earnest longing, and largely to prepare them for this visit he sent them his letter. See ROMANS, EPISTLE TO THE.

In the spring of 56 he left Corinth for Jerusalem with quite a company, who doubtless represented the churches that had been engaged in gathering a contribution for the Mother Church (Acts xx. 4. See also I. Cor. xvi. 1-4; II. Cor. viii.-ix.). After a journey which was accompanied by some incidents of a foreboding nature, to all of which Paul's mind seemed resignedly receptive, he reached Jerusalem (Acts xx. 3-xxi. 15). His reception by the brethren of the Church was full of Christian fellowship; at the same time it was clear that the leaders were deeply impressed by the growing alienation from Paul among the believing Jews. As a consequence they suggested that he carry out in the temple a certain course of ceremonial observance designed to show his respect for the Law of Moses, and to disprove the charge that he everywhere urged its abandonment by the Christian Jews. This he willingly did; but his action was so misunderstood and the motive for it so misconstrued as to rouse against him a riotous demonstration on the part of the Jews in general, that would have ended his life but for the rescue of his person effected by the soldiers of the adjoining Roman garrison (Acts xxi. 17-32).

It is clear from this incident, as presented in the passage cited, that the head and front of Paul's offending in the eyes of the Jews was not so much his heralding of the Messiahship of Jesus as his denial of the continued obligation of the Mosaic Law. This is instructive as to the large significance of the controversy which ensued upon his first mission journey and which, in spite of the wise action of the Jerusalem Council, wrought itself into the Galatian and to a certain degree into the Corinthian churches. Paul's position as to the absolute essentiality of the principle of justification by faith alone apparently went to the heart of the whole problem of salvation as it was present before the early Church.

Having found it impossible to secure from the excited mob any idea of the offense of which his prisoner was guilty, and Paul himself asserting his rights of Roman citizenship, the chief captain of the guard, Claudius Lysias, summoned a council of the Sanhedrin and brought Paul before

it for examination (Acts xxi. 33-xxii. 30). This gathering, however, resulting in nothing but disorder among the members of the court, and, information having been brought of a desperate plot against Paul's life by a secret band of Jews, Claudius Lysias sent him away by night under heavy guard to Cæsarea with letters to Felix, Governor of the Province of Syria, whose official residence was at that place (Acts xxiii.).

Paul's stay at Cæsarea, which lasted some two years, was practically a continued commitment for trial. He appeared before Felix soon after his arrival at Cæsarea and pleaded his cause against the High Priest Ananias and certain of the elders from Jerusalem, who were accompanied by counsel. But, though the prosecution failed to make out their case, no decision was reached by the Governor (Acts xxiv. 1-23). Later Paul was summoned before Felix and his wife to speak "concerning the faith in Jesus Christ," but, though the Apostle "reasoned of righteousness, temperance, and the judgment to come" in such a way as to make a terrifying impression upon Felix, the fear was wholly transient; for Paul was returned again to prison, where Felix kept him through the remainder of his term of office, arranging frequent hearings from him and interviews with him, in hope of securing from the Apostle a bribe for his release. Finally, in order to please the Jews, he handed him over bound to his successor, Festus (Acts xxiv. 24-27).

Before Festus Paul appeared but once, being again confronted with his accusers from Jerusalem, who as before failed to make out a case against him. When, however, the Governor seemed about to follow in his predecessor's steps and ignore the evidence presented, suggesting that Paul go up to Jerusalem for another trial, the Apostle, on the basis of his rights of citizenship, transferred the case to Rome by appealing to Cæsar. Such action left the Governor no further choice, though he took the opportunity of Agrippa's presence in Cæsarea to bring Paul once more into court, and to have his case heard by his royal visitor (Acts xxv.). In his defense, the Apostle presented before Agrippa the course of his life and the grounds of his Christian hope, persuading the King, as he had in fact both Governors, that there was no reason for his being retained in bonds (Acts xxvi. 1-31). Beyond such personal impressions, however, his plea was of no use, since his appeal to the Emperor made transportation to Rome obligatory upon the authorities (Acts xxvi. 32).

The voyage to Italy was begun in the fall of 58, being marked by disastrous experiences which resulted in shipwreck on the island of Malta (q.v.). There the company remained through the winter, continuing their voyage in the spring and reaching at last their journey's end at the Imperial capital some time in the early half of the year 59 (Acts xxvii. 1-xxviii. 14). Here Paul was cordially welcomed by the Christian brethren of the city and kindly received by the authorities, being allowed to reside under guard in his own hired house, with freedom of intercourse among his friends and liberty of preaching his gospel (Acts xxviii. 15-31). It was during this period of imprisonment that he wrote his letters to the Philippians, the Colossians, Philemon, and the Ephesians. Of these, Philippians and Philemon, especially Philemon, dwell upon the Apostle's personal relation to the readers, though the practical problems of Christian brotherhood and moral living emerge quite clearly in Philippians. On the other hand, Colossians and Ephesians were intended to counteract doctrinal errors of a subtle nature involving a large element of nascent Gnosticism. This is especially true of Colossians, Ephesians, as an encyclical letter, emphasizing rather the principles of Christian solidarity in the membership of the churches. See the articles on the above letters.

It is a matter of considerable debate as to what was the outcome of this imprisonment at Rome, though the better critical opinion of the present day tends in the direction of holding that after some two years Paul was brought to trial before Nero, and on the absence of any real evidence against him was released. After this release he returned to the region of his former missionary labors in the East, engaging again in active work, in the course of which he was rearrested and transported again as a captive to Rome. At his second trial he was sentenced to death, which was accomplished not later than the year 65. During this return he wrote the letter to Titus, and the first letter to Timothy, both of which have to do almost wholly with the practical matters of Church organization and discipline. His second letter to Timothy was written after his reimprisonment at Rome, shortly before his death, and is practically his last word of personal counsel and encouragement to his trusted helper and friend. See the articles on these letters.

The picture of Paul stands clearly before us in the records which the New Testament gives—a man of education, if not of culture, for his time—a Roman citizen and yet a Jew, a student of the Scriptures, a zealot in the law, and withal a conscientious seeker for the way of life within the circle of its precepts—consequently an earnest persecutor of the disciples of Jesus until divinely convinced of his error, when all his energy and enthusiasm and loyal devotion were transferred to his new life and infused into his new work. In this new life and work, however, Paul manifestly remained a Jew. He did not conceive of his Christianity as having severed him from the Israel of God, but rather as having enabled him to realize the ideal of Israel's Godward relations. His doctrinal thinking consequently found its historical and logical background in the Old Testament, rising through its anthropology and its soteriology to its climax in its Christology. His doctrine of Christ controlled all the rest of his theology. It was the beginning point of his preaching and formed the main theme of his last letters to his churches. In all his thinking he was intense and characteristically logical, though he often clothed his thought in the old Rabbinic forms which he had brought with him from the Jerusalem schools, and frequently yielded to the rhetorical impulses more or less belonging to his intensity of nature. He was not metaphysical, even in treating the profoundest themes, but practical in the extreme and sympathetic on broad and comprehensive lines. Though his position in the matter of relationship to ceremonial Judaism was not that of the Jerusalem leaders, his views came to dominate the Church, and he himself became the Church's leader in its world work. On the theology of the Church since his day his influence has not been

even. During the centuries immediately succeeding the Apostolic age it largely if not completely disappeared, being revived in its doctrine of man and of salvation in the theology of Augustine and receiving again at these points its conspicuous restoration in the essential position of the Protestant Reformation. Since then these Pauline doctrines have come and gone with the rise and fall of that trend of thinking which may be termed Calvinistic. To-day they are not prominent, being dominated by a mode of thought which is characterized by a spiritualism of the feelings that has come to us from the Schleiermacher school, though Paul's supreme doctrine of Christ, which really controls his thought, contributes more to the present-day exaltation of Jesus than is popularly supposed.

BIBLIOGRAPHY. For consideration of the sources (a) from the point of criticism: consult the New Testament introductions and the critical discussions referred to in articles on the Epistles and the Book of Acts; (b) from the point of exegesis: consult the commentaries referred to in these articles. For study of the times: Schürer, *Geschichte des jüdischen Volkes im Zeitalter Jesu Christi* (Eng. trans., New York, 1896); Weber, *Jüdische Theologie* (Leipzig, 1897); Ramsay, *The Church in the Roman Empire* (New York, 1894). For study of the chronology: Burton, *Records and Letters of the Apostolic Age* (New York, 1895); Clemen, *Die Chronologie der paulinischen Briefe* (Halle, 1893); Harnack, *Chronologie der altchristlichen Litteratur*, Band i. (Leipzig, 1897). For study of the man: Baur, *Paulus* (Eng. trans., Edinburgh, 1873-75); Renan, *Les apôtres* (Eng. trans., London, 1869); id., *Saint Paul* (Eng. trans., ib., 1887); Conybeare and Howson, *Life and Epistles of Saint Paul* (ib., 1850-52); Lewin, *Life and Epistles of Saint Paul* (ib., 1851); Farrar, *Life and Work of Saint Paul* (London, 1879); Stalker, *Life of Saint Paul* (New York, 1884); Matheson, *The Spiritual Development of Saint Paul* (Edinburgh, 1892); Ramsay, *Saint Paul the Traveller and Roman Citizen* (New York, 1896); Cone, *Paul the Man, the Missionary, and the Teacher* (New York, 1898); Gilbert, *The Student's Life of Saint Paul* (New York, 1899). Consult also McGiffert, *History of Christianity in the Apostolic Age* (New York, 1897). For study of Paul's teaching: Ritschl, *Entstehung der altkatholischen Kirche* (Bonn, 1857); Sabatier, *L'apôtre Paul* (Eng. trans., New York, 1891); Pfleiderer, *The Influence of the Apostle Paul on the Development of Christianity* (Hibbert Lectures for 1885; New York, 1885); Knowling, *The Witness of the Epistles* (London, 1892); Holsten, *Das Evangelium des Paulus* (Berlin, 1880-98); Bruce, *Saint Paul's Conception of Christianity* (New York, 1894); Stevens, *The Pauline Theology* (New York, 1892). Consult also the accepted works on New Testament theology.

PAUL. The name of five popes. PAUL I., Pope 757-767, the brother of Stephen II., whom he succeeded. He was the candidate of the Frankish party, and as Pope maintained close relations with Pepin I., whose help he needed both against the Lombards and against the Greek Emperor, who had not given up his claims to the exarchate and the Pentapolis. Pepin, however, was constant in his support of the Pope, and assured him a fairly peaceable possession of the ecclesiastical territory.—PAUL II., Pope 1464-71, Pietro Barbo. He was born at Venice in 1417, the nephew of Eugenius IV., to whom he owed his introduction to an ecclesiastical career. He was made a cardinal in 1440, and held a position of great influence under Nicholas V. and Calixtus III. Pius II., however, did not regard him so favorably, and his election to the Papacy as successor to Pius was largely due to the older cardinals, who had not been in sympathy with that pontiff. At the beginning of his reign he tried to form an alliance of Christian sovereigns against the Turks, but the circumstances of the time frustrated his purpose. He was obliged to oppose the claims of the French King, Louis XI., to absolute power, and demanded of him the repeal of the Pragmatic Sanction. He attempted to suppress the non-Christian or properly so-called humanistic Renaissance, especially by the dissolution of the Roman Academy, which had become a meeting-place for the enemies of religion, and by severe penalties against the scholars who combined pagan doctrine with pagan immorality.—PAUL III., Pope 1534-49, Alessandro Farnese. He was born in 1468, was educated in Rome by Pomponio Leto, and went to Florence, entering into close relations with the Medici. Alexander VI. made him a cardinal in 1493; later he became Bishop of Ostia and dean of the Sacred College. He held various important offices, twice representing the Pope during his absence as legate in Rome. He strongly advocated the calling of a general council, and was a member of the commission appointed by Clement VII. to consider the question. After his elevation to the Papacy, he vigorously pursued the reforming policy he had always advocated. He first summoned the council to meet at Mantua in 1536, then at Vicenza in 1538, and again at Mantua in 1542; but each time its assembly was prevented by the discord between Charles V. and Francis I. It finally met at Trent in 1545. (See TRENT, COUNCIL OF.) Against Henry VIII. of England he took decisive steps, finally issuing in 1538 the bull of excommunication and deposition prepared three years earlier. He took vigorous steps also for the suppression of Protestantism in Italy, reconstructing the Inquisition and establishing a strict censorship of books. (See INDEX.) The reproach of nepotism is brought against him. In 1545 he is to be credited with an enlightened patronage of letters and art. He made his natural son, Pietro Luigi Farnese, Duke of Parma and Piacenza, having appointed Michelangelo architect in chief of the Vatican and of Saint Peter's, and provided for many great works.

PAUL IV., Pope 1555-59, Giovanni Pietro Caraffa. He was born at Naples in 1476. In 1494 he entered the service of the Curia, and in 1507 was appointed Bishop of Chieti, in which see he labored most earnestly for the reformation of abuses, and for the revival of religion and morality. With this view he established, in conjunction with several congenial reformers, the congregation of secular clergy called Theatines (q.v.), and was himself the first superior. It was under his influence that Paul III. organized the Tribunal of the Inquisition in Rome. On the death of Marcellus II. in 1555, although in his seventy-ninth year, he was elected to succeed him. He enforced vigorously upon the clergy the observance of all the clerical duties, and enacted

for the maintenance of public morality. He established a censorship, and completed the organization of the Roman Inquisition; he took measures for the alleviation of the burdens of the poorer classes, and for the better administration of justice, not sparing even his own nephews, whom he banished from Rome on account of their corrupt conduct and profligate life. His foreign relations, too, involved him in much labor and perplexity. He insisted on the restoration of Church property in England, a demand which Julius III. had in the interests of peace refused to press; and on Elizabeth's accession declared her illegitimate and not entitled to the throne. He was embroiled with the Emperor Ferdinand, with Philip II. of Spain, and with Cosmo, Grand Duke of Tuscany. Having condemned the principles of the Peace of Augsburg, he protested against its provisions.—PAUL V., Pope 1605-21, Camillo Borghese. He was born in Rome in 1550. In his early life he was a distinguished canonist and theologian; and after the ordinary prelatical career at Rome he rose first to the post of Nuncio at the Spanish Court, and afterwards to the cardinalate under Clement VIII. His Pontificate is rendered memorable by the celebrated conflict with the Republic of Venice, into which he was plunged at the very outset of his career. The original ground of dispute was the question of the immunity of the clergy from the jurisdiction of civil tribunals. The Venetian Senate resisted the claim of the clergy to be tried by ecclesiastical tribunals; and further causes of dispute were added by a mortmain law, and a law prohibiting the establishment of new religious Orders or associations unless with the sanction of the Senate. Each party remaining inflexible in its determination, Paul issued a brief, directing a sentence of excommunication against the Doge and Senate, and placing the Republic under an interdict unless submission should be made within twenty-four days. The Senate persisted, and an animated conflict, as well of acts as of writings, ensued, in the latter of which the celebrated Fra Paolo Sarpi, on the side of the Republic, and on the Papal side Bellarmine and Baronius, were the leaders. Preparations were even made for actual hostilities; but, by the intervention of Henry IV. of France, the dispute was accommodated and peace restored in 1607, although dissatisfaction afterwards arose on the subject of the nomination of a patriarch. Paul's administration was a vigorous and noble one, and marked by the development of religious Orders and missionary enterprise. Consult his *Life* by T. A. Trollope (London, 1861).

PAUL I., PETROVITCH (1754-1801). Emperor of Russia from 1796 to 1801. He was the son of Peter III. and Catharine the Great. He underwent a vigorous training at the hands of his mother, and this served to harden and warp a nature which was by no means devoid of generous impulses. The memory of his father's violent death made him suspicious of all who surrounded him, and as prince or emperor prevented him from gathering a party around him. During his mother's lifetime he was allowed no share in the government, and with the exception of a journey abroad (1781-82) passed his time in brooding idleness on his estates at Gatchina. Catharine died November 17, 1796, while seriously contemplating the exclusion of Paul from the succession to the throne in favor of his son Alexander. Paul's reign began with fair promise, but speedily degenerated into an oppressive despotism which weighed alike on the Court, the army, and the intellectual life of the nation. The system of police espionage was developed to a hitherto unparalleled degree, and swift punishment was visited on those unfortunate enough to arouse the slightest suspicion in the Emperor's diseased imagination. Reluctant at first to enter the struggle against France, he finally joined the Second European Coalition against the French Republic in 1798, and in 1799 the Russian armies under Suvaroff (q.v.) gained a series of notable victories over the French and drove them out of Northern Italy. Bonaparte's astute diplomacy, however, succeeded in breeding dissension between the Russian Emperor and his allies. Paul's discontent was intensified by the conduct of England in refusing him possession of the island of Malta, to which as grand master of the Knights of Malta, an office assumed in 1798, he laid claim. His opposition to England finally developed into open hostility, and led in 1800-01 to the formation of the Northern Maritime League by Russia, Sweden, and Denmark against Great Britain. At home, meanwhile, Paul's despotism had become unendurable, and a conspiracy was formed by some of the highest officials about the Court to bring about the Emperor's abdication in favor of his son Alexander. The leaders of the conspiracy were Count Pahlen, Count Panin, Prince Suboff, General Bennigsen, and General Uvaroff. On the night of March 23, 1801, the Imperial palace was surrounded by the troops of Count Pahlen while the conspirators, some thirty in number, broke into Paul's chamber and at the sword's point demanded that he sign the act of abdication. No certain knowledge exists of what then occurred, but it would seem that the Emperor, crazed with fear, attempted resistance, that a scuffle ensued, and that in the struggle Paul was strangled with his own scarf. Of Paul's ten children, Alexander and Nicholas ruled over Russia, while Constantine was a prominent figure during the reign of the latter. Consult: Kobeko, *Der Cäsarewitsch Paul, 1754-96* (Berlin, 1886); Brenemann, *Aus den Tagen Kaiser Pauls* (Leipzig, 1886).

PAUL, APOCALYPSE OF. See APOCRYPHA, section on *New Testament*.

PAUL, CHARLES KEGAN (1828-1902). An English publisher and author, born at White Lackington, Somersetshire. He was educated at Eton and at Exeter College, Oxford; from 1853 to 1862 was a master at Eton, and, after twelve years as vicar of Sturminster, entered the publishing business, from which he retired in 1899. As an author he is best known for his biographies and translations: *A Translation of Faust* (1873); *Life of William Godwin* (1876); *Letters of Mary Wollstonecraft* (1879); *Biographical Sketches* (1883); *Maria Drummond* (1891); Huysmans's *En Route* (1896); and *Memories* (1899). In *Faith and Unfaith* (1891) Paul hinted at his own religious beliefs; he left the Church of England for Positivism, and in his last years entered the Roman Catholic Church.

PAUL, poul, HERMANN (1846—). A German philologist. He was born in Magdeburg; studied at Berlin and Leipzig, and in 1874 became professor in the University of Freiburg. In 1893 he

was appointed professor of German philology at the University of Munich. His publications include: *Gab es eine mittelhochdeutsche Schriftsprache?* (1873); *Zur Lautverschiebung* (1874); *Kritische Beiträge zu den Minnesingern* (1876); *Zur Nibelungenfrage* (1877); *Mittelhochdeutsche Grammatik* (5th ed. 1900). He is best known in the United States by his *Prinzipien der Sprachgeschichte* (1880; 3d ed. 1898), translated into English by Strong (1888), and retranslated with changes by Strong, Logeman, and Wheeler (1891). As editor of *Grundriss der germanischen Philologie* (1891-93; 2d ed. 1896 et seq.), he rendered valuable service to modern philology. After 1874 he with W. Braune edited the *Beiträge zur Geschichte der deutschen Sprache*.

PAUL, pâl, Lewis (?-1759). An English inventor, of whose life very little is known. About 1729 he invented a pinking machine, and his acquaintance with Dr. Johnson seems due to the fact that Mrs. Desmoulins had learned pinking from him. Paul's important patent dates from 1738, and it is the earliest machine for the spinning of wool or cotton by two pairs of revolving rollers. The factories established at Birmingham and Northampton met with no success. Two other patents taken out by Paul were a carding machine (1748) and a spinning machine (1758). They seem to have been no more successful than the first, which, however, was the basis of Arkwright's invention.

PAUL, poul, Oskar (1836—). A German writer on music, born at Freiwaldau, Silesia. He was a pupil of Klingenberg at Görlitz, then of Plaidy, Richter, and Hauptmann at the University of Leipzig, and after sojourns in different German towns he returned to Leipzig (1866), to give private lessons in harmony. Three years afterwards he began to teach musical history in the conservatory of that city, and in 1872 he was appointed professor extraordinarius at the university. He founded and edited the periodical *Tonhalle*, which was merged into the *Musikalische Wochenblatt;* published Hauptmann's *Lehre der Harmonik* (1868); wrote *Geschichte des Claviers* (1869); *Handlexicon der Tonkunst* (1871-73); and made the first German translation of *Boëthius* (1872).

PAUL, pôl, Vincent de. See Vincent de Paul, Saint.

PAUL, Vision of. See Apocrypha, section on *New Testament*.

PAUL AND VIRGINIA (Fr. *Paul et Virginie*, pôl-â-vêr'zhē'nē'). A well-known romance by Bernardin de Saint-Pierre (1788), the scene of which is laid in Mauritius, where the author had spent three years. It exhibits great powers of description and emotional force, with exaggerated sentiment and a not altogether healthy atmosphere. It is the story of two playmates whose affection develops into love, and ends with the drowning of Virginia and the death of her lover from grief.

PAUL CLIFFORD. A novel by Bulwer-Lytton (1833). It is the story of a chivalrous highwayman in the time of the French Revolution. Paul Clifford, of unknown birth, brought up in evil, is arrested for theft and becomes a highwayman. As Captain Clifford he loves Lucy Brandon, but is brought before her uncle, Judge Brandon, for a robbery. He proves to be Brandon's stolen child, is condemned to death by his father, but escapes with Lucy to America.

PAUL'DING, Hiram (1797-1878). An American naval officer. He was born in New York City, entered the United States Navy as a midshipman in 1811, participated in the battle of Lake Champlain (September 11, 1814), receiving a vote of thanks and a sword from Congress for his services, served under Commodore Decatur against the Barbary Powers in 1815, and in the following year was promoted to a lieutenancy. He accompanied Commodore Porter on an expedition against the West Indian pirates in 1822-23, acting as first lieutenant of the *Sea Gull*, said to have been the first steamer ever used for purposes of war; served on the *Dolphin* in 1826 when that vessel was sent to the Mulgrave Islands in search of the mutineers of the American whale ship *Globe;* cruised in the East Indies, in command of the *Vincennes*, from 1844 to 1847; was in command of the Washington Navy Yard from 1851 to 1854; and from 1854 to 1857 was commander of the home squadron, at the time the highest position in the navy. For arresting the filibuster Walker (see Walker, William) at Greytown, Nicaragua, in December, 1857, he was relieved from command by President Buchanan, though the Republic of Nicaragua, in recognition of his services, presented him with a sword and a large tract of valuable land, which latter Congress did not allow him to accept. On the outbreak of the Civil War he was ordered to Washington to assist Secretary Welles of the Navy Department, and in April, 1861, proceeded to Norfolk and destroyed the navy yard there. Having passed the age limit of sixty-two years, he was technically retired in December, 1861. In the following year he was promoted to the recently created grade of rear-admiral, on the retired list, and subsequently was commandant of the New York Navy Yard from 1862 to 1866, in which position he rendered important services to the Government by sending many vessels and thousands of men to the front; was Governor of the Naval Asylum in Philadelphia from 1866 to 1869, and was port admiral at Boston from 1870 to 1871. He published a *Journal of a Cruise Among the Islands of the Pacific* (1831). Consult a biographical sketch by Meade in *Harper's New Monthly Magazine*, vol. lviii. (New York, 1879).

PAULDING, James Kirke (1779-1860). An American author, born in Pleasant Valley, Dutchess County, N. Y. After a scanty education he went to New York, where, with William Irving, his brother-in-law, and with Washington Irving, he collaborated in *Salmagundi* (1807), the second series of the same (1819) being by Paulding alone. During the War of 1812 he published the *Diverting History of John Bull and Brother Jonathan;* and in 1814 the *United States and England*, a defense against British criticisms. This work attracted attention and caused him to be appointed secretary of the board of navy commissioners. In 1817 he published a defense of the Southern States and of slavery in *Letters from the South, by a Northern Man;* in 1822, *A Sketch of Old England, by a New England Man;* and in 1825 *John Bull in America, or the New Munchausen*, a satire on the writings of British tourists. Meanwhile he had published his first novel, *Koningsmarke* (1823); *Merry*

Tales of the Three Wise Men of Gotham (1826) [illegible], and other books, mainly humorous and satirical. In 1831 he produced *The Dutchman's Fireside*, a novel dealing with the old Dutch settlers. This, his best work, was followed by *Westward Ho!* (1832), a novel dealing with Kentucky. Next came a good biography of Washington (1835), and *Slavery in the United States* (1836). Meanwhile he had been navy agent at New York City since 1825, a position from which he was advanced in 1837 to the post of Secretary of the Navy in Van Buren's Cabinet. On his retirement in 1841 he went to a country residence at Hyde Park, where he wrote a few stories and plays, the novel, *The Puritan and His Daughter* (1849), being the most conspicuous. There he died, April 6, 1860. His select works appeared in four volumes (1867-68). Consult *Literary Life of James K. Paulding*, by his son William (New York, 1867).

PAULDING, John (1758-1818). An American Revolutionary soldier, born in New York City. He, together with Isaac Van Wart and David Williams, captured Major André near Tarrytown, September 23, 1780, and for this received from Congress a silver medal bearing the inscription "Fidelity" on one side, and "Vincit amor patriæ" on the other. He was a prisoner three times during the Revolutionary War, being released the second time only four days before André's capture.

PAULI, pou'lē, Karl (1839—). A German philologist. He was born at Barth, in Pomerania, studied at Erlangen and Greifswald, and, after teaching in various gymnasiums and spending several years in Leipzig, in 1893 became professor in the Lyceum of Lugano, in Switzerland. Pauli's especial study was on the languages of Italy, above all Etruscan. He published: *Etruskische Studien* (1879-80; completed in Deecke's *Etruskische Forschungen und Studien*); *Altitalische Studien* (1883-87); *Altitalische Forschungen* (1885-94); and, with Danielsson, *Corpus Inscriptionum Etruscarum* (1893 et seq.).

PAULI, Reinhold (1823-82). A German historian. He was born in Berlin, studied there and at Bonn, and lived for several years in England, in antiquarian research and as secretary to the Prussian ambassador, Bunsen. In 1866 he lost his professorship at Tübingen because of an attack on the policy of Württemberg. In the following year he was appointed professor at Marburg and in 1870 at Göttingen. His historical works are marked by a lucid style and by painstaking research. They include: *König Alfred und seine Stelle in der Geschichte Englands* (1851); a continuation of Lappenberg's *Geschichte von England* (1853-58), an able work; *Bilder aus Altengland* (1860; 2d ed. 1876); *Geschichte Englands seit den Friedensschlüssen von 1814 und 1815* (1864-75); *Simon von Montfort* (1867); and a sketch of Cromwell (1874). Pauli edited in 1856 Gower's *Confessio Amantis*.

PAULICIANS. An Oriental Christian sect, which flourished in the eighth and ninth centuries, although survivors are found much later. It has generally been represented as an offshoot of the Manichæans (see Manichæism), but recent investigations make it probable that it is of independent origin. In a work entitled *The Key of Truth*, dating in its present form probably from the ninth century, and representing the contemporary usages and beliefs of the Paulicians in Armenia, survivals of ancient baptismal and ordination forms are found, which indicate some connection between this Church and the older Adoptionists. The Adoptionists taught that Christ was a man who, at his baptism, became by adoption the Son of God, instead of being so by nature, or eternally (the Catholic doctrine). This type of Christology goes back to the end of the second century, when it was brought to Rome by Theodotus. (See Monarchians.) The origin of the name Paulicians is uncertain, but an eleventh-century opponent of the movement traces it to Paul of Samosata (q.v.), Bishop of Antioch in the latter part of the third century, the last great Adoptionist teacher, and this is the most plausible derivation yet suggested. Ancient writers like Petrus Siculus and Photius (ninth century) say that Paulicianism arose in Armenia some two hundred years before their time. Their leader was one Constantine (Sylvanus), and the sect stood in opposition to the Catholicus, or head of the National Church, on several points of doctrine and practice. They rejected the authority of the hierarchy, and chose religious leaders of their own, the 'elect ones,' wherein lies one resemblance between them and the mediæval Manichæan sects. These facts have led many writers to speak of them as 'Protestants.' In the ninth century the Paulicians enjoyed a vigorous ecclesiastical life, especially under a leader named Baanes, from whom they are sometimes known as Baanites, but they were subjected to severe and repeated persecution at the hands of the Church and of the Byzantine Emperors. Under such provocation they for a time joined forces with the Mohammedans against all Christian powers. In the eighth century, and again in the tenth, some of them were removed from Asia Minor to the upper part of the Balkan Peninsula, to serve as an outpost against the Slavic tribes of the north, and thus a considerable Paulician population was established in Europe. Their influence penetrated into Bulgaria, and here no doubt is one source of those mediæval movements generally classed as Manichæan, which include the Bogomiles, Cathari, and Albigenses (qq.v.). A few surviving Paulicians were discovered in Southeastern Europe in the eighteenth century, and larger numbers of them in Armenia in the nineteenth. Here was found their book, *The Key of Truth*, which has thrown new light on some obscure points of their history. Consult: Gibbon's *Roman Empire*, especially vol. vi., app. 6 (ed. by Bury, London, 1896 et seq.); Conybeare, *The Key of Truth* (Oxford, 1898); Newman, *Manual of Church History*, vol. i. (Philadelphia, 1900); Lynch, *Armenia, Travels and Studies* (London, 1901).

PAULINE EPISTLES. A group of New Testament letters, claiming in their superscriptions to have been written by the Apostle Paul and comprising the following thirteen writings: Romans, I. Corinthians, II. Corinthians, Galatians, Ephesians, Philippians, Colossians, I. Thessalonians, II. Thessalonians, I. Timothy, II. Timothy, Titus, Philemon.

PAULI'NUS, Meropius Pontius Anicius, Saint (353-431). He was born at Bordeaux, France, and became a pupil of the poet Ausonius, who secured him the favor of the Emperor Gratian. He attained the dignity of *consul*

suffectus, and married a wealthy Spanish lady named Therasia. Through the efforts of Saint Ambrose he was converted to Christianity, distributed most of his property among the poor, and continued for a time to reside in Spain. He was ordained a priest in 393, at Barcelona, but soon left Spain for Rome. In 394 he went to Nola, where he had an estate. Near the city was the tomb of the martyr Felix, over which a church had been built, with a few cells for pilgrims. Here Paulinus lived for fifteen years in a strictly monastic fashion, except that his wife seems to have been with him. In 409 he was made Bishop of Nola, a position which he retained till his death. He was present at the Council of Ravenna in 419. Of his works there have been preserved 50 epistles, 32 poems, and a tract called *Passio S. Genesii Arelatensis*. His name is of frequent occurrence in the letters of Augustine and Jerome. The works of Paulinus will be found in vol. lxi. of Migne's *Patrologia Latina* (Paris, 1861). Consult Lagrange, *Saint Paulin de Nole* (Paris, 2d ed., 1882).

PAULINUS, Saint (died 644). A missionary sent to England by Pope Gregory I. in 601, where he joined Augustine (q.v.). In 625 he was made bishop by Archbishop Justus of Canterbury, and went to Northumbria, in attendance on Ethelburga, daughter of Ethelbert, King of Kent, and wife of Edwin (q.v.), King of Northumbria. Edwin was still a pagan at the time, but in 627, through the influence of his wife and Paulinus, he caused himself to be baptized, together with many others. Soon afterwards Paulinus founded the cathedral at York. On the overthrow of King Edwin in 633 the Northumbrians relapsed into heathenism, and Paulinus fled to Kent, where he became Bishop of Rochester. He died October 10, 644. Consult Bright, *Early English Church History* (Oxford, 1878).

PAULISTS. The ordinary designation of the Congregation of Missionary Priests of Saint Paul the Apostle. This is a society founded in New York in 1858 by Father Hecker (see Hecker, Isaac Thomas) and some other priests. Their desire was to form a community of priests for missionary work in America, composed chiefly of those whose native tongue was English; Hecker had left the Redemptorists largely on the ground that the members of that Order working in America were mostly of German birth, and did not understand the needs of the country. The plan was approved by Archbishop Hughes, and received the Papal confirmation from Pius IX. The mother house of the community, most of whose members are converts from Protestantism, is in New York. The Paulists devote themselves especially to mission preaching, and have been the main promoters of the remarkable movement originating in the last years of the nineteenth century toward a systematized effort to extend their faith among the non-Catholics of America which has taken shape in the foundation of a central training house for such work at Washington. Their magnificent church in New York is noted for the perfection of its services, both in the direction of punctilious carrying out of the rubrics and of Gregorian music. They also carry on the Catholic Publication Society work, with a printing plant of their own, and publish a monthly magazine called *The Catholic World*.

PAULITES (ML. *Paulita*, from Lat. *Paulus*, Paul). An Order of hermits which arose in Hungary in the thirteenth century by the union of two earlier communities, those of Patach and Pisilia, under Eusebius of Gran, the founder of the latter, who united both of them in 1250 and became the first superior of the joint Order. Eusebius died in 1270; the rule of Saint Augustine was adopted in 1308, and the Order, which was confirmed by Pope John XXII., spread throughout Northern Europe, until it numbered 170 cloisters in Hungary alone, in which country many of its members filled the highest ecclesiastical offices. They were introduced into Portugal in 1420, and into France, where they were commonly known as Brothers of Death (see Death, Brethren of) and much favored by Louis XIII. The Order in France seems to have been suppressed by Pope Urban VIII. It has practically died out everywhere except in Cracow and Poland.

PAULITSCHKE, pou-lich'ke, Philipp Viktor (1854-99). An Austrian geographer and explorer of Northeastern Africa. He was born in Moravia, was educated in the universities of Gratz and Vienna, and in 1883 was appointed docent in the University of Vienna. His first trip to Africa was in 1880, when he made ethnological studies in Egypt and Nubia; but the expedition undertaken in 1844, starting from Harar and going south through Somaliland, was much more important, especially as it covered new territory in Galla. Paulitschke's writings include: *Die geographische Erforschung des afrikanischen Kontinents von den ältesten Zeiten bis auf unsere Tage* (1880); *Die Afrika-litteratur von 1500 bis 1750* (1881); *Leitfaden der geographischen Verkehrslehre* (2d ed., 1892); *Die geographische Erforschung der Adalländer und Harrars* (1884); *Die Sudanländer* (1885); *Beitrage zur Ethnographie und Anthropologie der Somal, Galla und Harrari* (1886); *Die Wanderungen der Oromo* (1888); and *Ethnographie Nordostafrikas* (1893-96).

PAULLINIA (Neo-Lat., named in honor of C. F. *Paullini*, a German botanist [1643-1712]). A climbing plant of the order Sapindaceæ, native in Brazil. A paste made of the crushed seeds and leaves of *Paullinia Sorbilis* or *Paullinia Cupana* is called guarana, and is used in medicine. The dried paste occurs in brown cakes or sticks, with an odor of chocolate and a bitter taste, partly soluble in water and in alcohol. As the preparation of this paste is a secret, the other ingredients are not known. It yields an alkaloid, *guaranin*, which is considered to be identical with *caffeine* (q.v.), and has the same therapeutic and physiological effects. A fluid extract of guarana is official, which has been used in migraine chiefly, but also in wasting diarrhœa and as a tonic.

PAULO AFFONSO, pou'lō åf-fōn'so, Falls of. See São Francisco.

PAUL OF SAMOS'ATA. Bishop of Antioch in the third century. Beyond the fact that he was born at Samosata, little is known of his early life. He was at first a sophist and obtained admittance among the clergy in some unknown way. He became Bishop of Antioch (260), probably through the influence of Zenobia, Queen of Palmyra. He was a Monarchian and his opponents do not give a good account of him. They assert that his character previous to his appointment

was in some respects unworthy of the episcopal office, and that after his elevation he was rapacious, arrogant, and vain. His heresies caused several councils to be convened to consider his case; by the last of these, held about 269, he was divested of his office and excommunicated. Trusting to the favor of both Queen Zenobia and the populace, he refused to vacate the episcopal residence, in which also the meetings of the Church were held. In 272 the Emperor Aurelian, having conquered Zenobia, referred Paul's case to the bishops of Rome and of Italy, and they decided against him. There is no notice either of the time or place of his death.

PAUL OF THEBES, Saint (c.235-c.347). The first well-known hermit in the Christian Church, called, by Saint Jerome, the founder of Monasticism. He was born at Thebes, in Upper Egypt, and at the age of fifteen fled to the desert to escape the Decian persecution. Here he lived about a hundred years in prayer and mortification, and trained Saint Antony to be his successor in the leadership of those who sought an ascetic life in retirement from the world. See Antony, Saint.

PAUL OF THE CROSS, Saint (1694-1775). The founder of the Order of Passionists (q.v.). His original name was Paolo Francesco Danei; he was born at Ovada, near Genoa. With a few companions, he began to live a hermit's life on Monte Argentaro, where he believed that God revealed to him that he should found a new Order, even showing him its destined habit. The Bishop of Alessandria, after careful investigation, clothed him with this habit, and allowed him even as a layman to preach repentance and conduct spiritual exercises. In 1727 he was ordained priest, and ten years later the first permanent settlement of Passionists was made on Monte Argentaro; from this time the founder took the name of Paul of the Cross. After a life of penance and labor, he died in Rome, October 18, 1775. He was canonized by Pius IX. in 1867. Consult his *Life* by the Passionist Father Pius (Dublin and New York, 1867).

PAULOWNIA, pą-lō'nı-ą (Neo-Lat., named in honor of Anne *Paulovna*, daughter of Paul I., Czar of Russia). The common and generic name of an ornamental Japanese tree of the natural order Scrophulariaceæ, which attains a height of 20 to 40 feet. It has somewhat the appearance of a catalpa, the heart-shaped leaves being similar, but much more downy. The flowers, borne in panicles in spring, are perfumed, violet-colored, two inches long, somewhat cylindrical, with rounded lobes at the mouth. The tree was formerly much planted in the United States, but, not proving equal to expectation, has lost in popular favor. It is not hardy north of New York, and even there and farther south it often fails to bloom for several seasons in succession. The branches are crooked, spreading, and nearly horizontal. Since the flower buds are carried over winter, a severe winter generally blights them. The growth of the tree in a favorable climate is very rapid and vigorous. When annually cut to the ground it is said to form a good hedge of young growths remarkable for the striking appearance of the leaves.

PAUL PRY. A successful comedy by John Poole, produced in 1825. The title character is an exceedingly curious, meddlesome person, who on trivial pretenses interrupts every interesting situation in the play.

PAULSEN, poul'sen, Friedrich (1846—). A German philosopher of the Neo-Kantian school. He was born in Langenhorn, Schleswig, and studied at Erlangen and at Berlin, where he became docent in 1875, and in 1878 professor of philosophy and pedagogy, and where his lectures were among the most widely attended in Germany. His chief works in the latter branch are "Gründung, Organisation und Lebensordnungen der deutschen Universitäten im Mittelalter," in Sybel's *Zeitschrift* (1881); *Geschichte des gelehrten Unterrichts auf den deutschen Schulen und Universitäten* (1885; 2d ed. 1896); *Realgymnasium und humanistische Bildung* (1889); and *Höhere Schulen und Universitätsstudium im 20. Jahrhundert* (1901). As a philosopher Paulsen ranks as a disciple of Fechner in metaphysics, holding his pan-psychic doctrine and agreeing with him as to the parallelism between physical and mental. In general, his agreement with Fechner is best seen in the widely known *Einleitung in die Philosophie* (1892; 7th ed. 1900), of which an English version appeared in 1895. Equally characteristic is the important genetic study of the Kantian system, *Versuch einer Entwicklungsgeschichte der Kantischen Erkenntnisstheorie* (1875), and the supplementary work, *Immanuel Kant* (1898; 2d ed. 1899). His other works are: *Kant der Philosoph des Protestantismus* (1899); *Schopenhauer, Hamlet und Mephistopheles* (1900), a series of essays; *Philosophia Militans* (1900) 2d ed. 1901), a reply to Haeckel's *Welträtsel;* and the excellent manual, *Ethik* (1889; 5th ed. 1899; partial English version, 1899), which is especially noteworthy for its historical sketch and for its practical treatment of the ethics of every-day life and of politics. The last topic is considered in *Parteipolitik und Moral* (1900).

PAULSEN, John (1851—). A Norwegian poet and novelist, born at Bergen. There he was for some time employed in the Portuguese consulate. Having entered literature with *Af Byliret* (1875; 2d ed. 1890), thanks to Ibsen's influence, he received a State stipend and spent several years abroad, returning to Norway in 1882 only temporarily, and spending most of his time in Denmark. Among his works are: *Moll og Dur* (1876), a volume of poems; *Margherita*, one of the first Norwegian problem-stories (1880); *En digters Ilustru* (1884) and *En Fremtidskvinde* (1887), both of which were translated into German, as was *Jödinden* (1892); *Nye Melodier* (1894); and a play, *Falkenström og son*, which met with success in Norway and in Germany.

PAULUS, pou'lus, Heinrich Eberhard Gottlob (1761-1851). A German theologian and one of the leaders of the Rationalist school. He was born at Leonberg, near Stuttgart, September 1, 1761. He studied Oriental languages at Göttingen, London, and Paris. In 1789 he was called to the professorship of Oriental languages at Jena, and in 1793 became professor of theology. Here he especially signalized himself by the critical elucidation of the Scriptures of the Old and New Testament, in so far as they presented Oriental characteristics. In 1811 he accepted the professorship of exegesis and

ecclesiastical history at Heidelberg. He died August 10, 1851. Among his numerous writings may be mentioned: *Clavis über die Psalmen* (1791); *Clavis über Jesaias* (1793); *Philologisch-kritischer und historischer Kommentar über das Neue Testament* (1800-04); *Sammlung der merkwürdigsten Reisen in den Orient* (7 vols., 1792-1803); *Leben Jesu, als Grundlage einer reinen Geschichte des Urchristentums* (1828); *Aufklärende Beiträge zur Dogmen-, Kirchen- und Religionsgeschichte* (1830); and *Exegetisches Handbuch über die drei ersten Evangelien* (1830-33). Consult: Paulus, *Skizzen aus meiner Bildungs- und Lebensgeschichte zum Andenken an mein 50-jähriges Jubiläum* (Heidelberg, 1829); and Reichlin-Meldegg, *H. E. G. Paulus und seine Zeit* (Stuttgart, 1853).

PAULUS, Julius. A distinguished Roman jurist, who lived in the latter half of the second century and the earlier decades of the third. He was an assessor or associate justice under Papinianus, when the latter was prætorian prefect or chief justice of the Empire, in the reign of Septimius Severus; was exiled by Elagabalus; was recalled and made prætorian prefect by Alexander Severus. Paulus was one of the most fertile of Roman legal writers. In addition to commentaries on the civil law (16 books) and on the prætorian or equity law (78 books), he published a great number of monographs on special topics, and 48 books of 'questions' and 'responses.' He published also a succinct presentation of the entire law, civil and prætorian, under the title of *Sententiæ* (5 books), and two books of 'institutes' for beginners. He was regarded by the later Romans as the equal of his contemporary, Ulpian, and as inferior only to Papinianus. His style, however, is less clear than Ulpian's. Excerpts from his writings make up more than one-sixth of the Digest of Justinian. A part of his *Sententiæ* has come down to us in the Breviary of Alaric (q.v.), and this text is included in Huschke, *Jurisprudentiæ Anti-Justinianæ quæ Supersunt* (4th ed., Leipzig, 1879). A fuller text, which includes the passages preserved in the Digest, may be found in Krüger, Mommsen, and Studemund, *Collectio Librorum Juris Antijustiniani* (Berlin, 1878-90).

PAULUS, Lucius Æmilius. A Roman general. See Æmilius Paulus.

PAULUS DIAC'ONUS (Lat., Paul the deacon) (c.720-c.800). The best historian of the Lombards. He was descended from a noble family, which had settled in Friuli. He received an excellent education either at Pavia or Friuli, and was at the former city while King Ratchis (744-49) ruled there, and became the tutor of Adelperga, daughter of King Desiderius. After the destruction of the kingdom at Pavia, if not earlier, he very likely took refuge at the Court of Duke Arichis, the husband of Adelperga. For the latter he wrote his *Historia Romana*, which was chiefly a compilation of works still in our possession, and was greatly used as a text-book for centuries after. About this time Paulus entered the monastery at Monte Cassino. In 782 Paulus journeyed to the Court of Charles the Great in order to obtain the release of his brother and other captive Lombards. His mission was successful, while he himself was induced by King Charles to remain and lend his aid in the reawakening of learning. It was here that he made his collection of homilies, known as *Homilarium*, which have been translated into many languages. At the request of Bishop Angilram of Metz, he also wrote *Gesta Episcoporum Mettensium* (History of the Bishops of Metz). Finally, after repeated petitions, Paulus was permitted to return to his beloved convent, probably accompanying Charles to Italy in 786. At Monte Cassino Paulus now wrote his most important work, *De Gestis Langobardorum* (History of the Lombards), which ends with the year 744. The work is remarkable on account of its pure Latin and the vast number of poetic legends of the early Germans it has preserved. Paulus was also the author of a number of theological works, and of some hymns and letters still extant. The best edition of his works is to be found in the *Monumenta Germaniæ Historica* (Hanover, 1878-79). For other editions and the like, consult Potthast, *Bibliotheca Historica Medii Ævi*, vol. ii. (2d ed., Berlin, 1896); Wattenbach, *Deutschlands Geschichtsquellen*, vol. i. (6th ed., Berlin, 1893). There is an excellent German translation of the Lombard History with a serviceable introduction by Jacobi in *Geschichtsschreiber der deutschen Vorzeit. Achtes Jahrhundert*, vol. iv. (Leipzig, 1888).

PAULUS HOOK, Capture of. See Jersey City, N. J.

PAUL VERONESE. See Veronese, Paul.

PAUMOTA (pä'ụ-mō'tä) **ISLANDS.** A group of islands in the South Pacific. See Low Archipelago.

PAUNCEFOTE, pąns'fụt, Lord Julian (1828-1902.) A British diplomat, born in Munich, Germany, of English parents. He was educated at Marlborough College, in Paris, and in Geneva, and was called to the bar in 1852. Three years afterwards he became private secretary to Sir William Molesworth, British Colonial Minister, and on the death of his chief, the following year, Pauncefote went to Hong Kong, where he practiced law successfully, and in 1866 was made Attorney General of the colony. He was appointed the first Chief Justice of the federated British Leeward Islands in 1874, knighted and made Assistant Under-Secretary for the Colonies the same year, and in 1876 was given the corresponding position in the Foreign Office. He was made Permanent Under Secretary of State for Foreign Affairs in 1882, served as British Commissioner to Paris in the Suez Canal negotiations in 1885, and was appointed Minister to the United States in 1889. His title was changed to Ambassador when that office was created in 1893, and he was the first to bear that title in this country. Queen Victoria made him a Privy Councilor in 1894. In the Bering Sea, the Venezuelan, and other difficulties between Great Britain and the United States, Pauncefote's large experience, knowledge, and tact in dealing with international affairs were powerful upon the conciliatory side, and his friendliness to the United States was shown in his efforts to have the Clayton-Bulwer Treaty abrogated. He was a British delegate to the Peace Conference at The Hague in 1899, and for his services there was raised to the peerage as Baron Pauncefote of Preston.

PAUPERISM (from Lat. *pauper*, poor). The condition of those who are partly or wholly dependent upon private charity or public aid for

support. Technically, in law, a pauper is a person supported by the public authorities, at the expense of taxpayers. In its broadest meaning the term pauperism should not be used synonymously with poverty, or even with occasional acceptance of relief, but only to designate a state of chronic dependence. Pauperism is possible only in communities where extreme poverty and surplus wealth exist together, and in combination with a prevailing sentiment of pity. In primitive communities, where pity is lacking and the means of subsistence are often inadequate, the hopelessly ill and the aged as well as the irredeemably lazy starve or are put to death. In barbarian societies, where pity is still lacking, although some accumulations of wealth have appeared, weak or deformed children are commonly dispatched, while the aged receive scant consideration.

Chief among the more important causes of destitution in civilization are improvidence, sickness, accident, death of the head of the family, and old age. Charles Booth's investigations of English pauperism have shown that old age is, all in all, the chief cause. Destitution, however, may exist, and yet pauperism be averted through a wise administration of private agencies of relief. Destitution at one end of the social scale, abundant means in the hands of kindly disposed but thoughtless givers at the other end, and sentimentality in public administration being given, destitution is rapidly converted into pauperism. In general, we may say that improvidence, sickness, or other misfortune, and old age, are the causes of *destitution*, and that an unwise dealing with destitution is the great cause of *pauperism*.

History of Pauperism. On account of the simplicity of their economic life, great poverty was rare among the Jews. The care of the poor was left to custom and religion. The gleaning of the olive and vine orchards and of grain fields belonged to the widows and orphans. (Deut. xiv. 28-29; xxiv. 19-22; xxvi. 12-13.) Charity was, however, limited by racial lines, and there was little provision for the alien. Under Christianity there was a great development of charity. Men were to feed the hungry, give the thirsty to drink, clothe the naked, shelter the stranger, care for the sick, visit the prisoner. In the early Church the free gifts of the members were distributed by the bishops and deacons to those who were known by the members to be in need. Within the Church the situation seems to have been excellent.

Greece as early as Pisastratus provided for those wounded in battle. Later those unable to work (*ἀδύνατοι*), if they possessed property valued at less than about $60, received from 1 to 2 obols per day (10 obols = 5 cents). As wages were 2 to 3 obols a day, the amount received must have sufficed for support. In Athens poor persons found shelter in houses without doors. There were in many cities unions (*ἔρανοι*) which provided against poverty.

In Rome the donations of food and grain were for political effect, in part at least. Gaius Gracchus supplied Rome with grain at cost. Clodius gave it free to poor citizens, and in B.C. 33 the amount spent for grain was 10,000,000 sesterces, about $433,000, which rose in A.D. 46 to sevenfold. Cæsar found 301,000 persons receiving grain and limited the number to 150,000, but this figure was exceeded under Augustus. The conditions which entitled men to grain were full citizenship and residence in Rome. Under Aurelius the donations consisted of bread, oil, and meat. From the time of Nerva emperors as well as private citizens gave funds for the education of children, as Forax Antonius in honor of his wife, Faustina (Puellæ Faustinianæ).

After Constantine great churches replaced the small communions, with the result that the effectiveness of the earlier charity of the Church was impaired. The Church received vast wealth, and great sums were given for the poor. Large institutions arose for widows and children. Rome and other cities were divided into districts in charge of deacons who dispensed alms. In Rome one-fourth of the goods was set apart for the poor. But the old voluntary offerings disappeared and donations came from the Church funds. After the fifth century the decline of charity is obvious, and beggars increased to an enormous extent.

During the Middle Ages the Church taught that almsgiving was a means of obtaining grace, but pauperism became too extensive to be adequately met by private charity. Charlemagne brought pressure on the bishops and lords to support the poor. In 779, a year of special need, he imposed a poor tax and expressly forbade begging. He also made arrangements for caring for widows, orphans, and strangers, but the system went to pieces at his death. The benefactions of the Middle Ages were numerous and varied. There were hospitals of all sorts for the aged sick, the criminal, the homeless, and for pilgrims; free baths; houses for the poor. The charitable orders were also well developed. But no systematic attempt was made to diminish pauperism. There was no discrimination between worthy and unworthy, the least deserving often receiving most. Great swarms of beggars arose and threatened to overrun Europe. (See Mendicancy.) In the fifteenth century city authorities begin to take part in the relief of poverty. In 1437 Frankfort had city almoners. Cologne undertook some supervision of the poor in 1450, and Antwerp in 1458 had an Armenmeester. The city council became the guardian of orphans and the insane. But the measures taken to suppress mendicancy were regulative, in effect licensing it, and proved unsatisfactory.

Luther, in his letter to the German nobility, laid the foundations of a new policy. He advocated the control of poor relief by the cities. The relief should be limited to what was absolutely necessary, and should be given only after investigation; the worthy poor should be distinguished from tramps and impostors. In this scheme the idea of almsgiving as a means of salvation disappeared. Augsburg (1522), Strassburg, Breslau (1523), Regensburg, Magdeburg (1524), and other cities began a reorganization of poor relief. The question as to the relative spheres of Church and State at once arose, and was variously determined. In the main the old parishes formed the poor relief districts. Efforts were made to gather the various funds into one treasury controlled by deacons (in Hamburg there were three deacons, in Lübeck twelve), whose time of service was only one or two years. They were at first elected, but later on appointed, and they rendered yearly accounts. Alms were distributed to the poor at their homes,

or occasionally given out at the church. Necessaries of life were sold at low rates. Labor was secured when possible. But the charges were too great for continued success and there were other handicaps. The short term of the deacons made systematic effort impossible: the existence of old orders and institutions caused cross-currents, and the plans gradually failed.

The German development begins again after the Thirty Years' War. Edict after edict against begging came to naught, but some progress was made toward fixing the responsibility for support, and in the regulation of marriage. By the end of the seventeenth century poor-houses and houses of correction appear. The teaching of Thomasius and of Gallert and the Pietist movement strengthened humane feeling, and in the writings of Garve, Resewitz, Rochow, and others a literature of poor relief appeared. Many patriotic and benefit societies were founded. In Hamburg (1788) the general poor-house was created. Visitors (180) were appointed to gather information. The poor were given work, various trades were started at the poor-house, and deficient earnings were supplemented. At first results were favorable. In the first ten years the number of the poor in institutions sank from 9757 to 4751. In 1801, however, the institution had a deficit of $15,000, which increased from year to year. In Prussia poor associations (Armenverbände) were organized, and rules regarding the responsibility for support were adopted. Parishes had to support residents of three years' standing, those without legal residence being cared for out of special or general funds. Schools of industry appeared. Pestalozzi gave an impetus to special institutions for children, and institutions for the deaf and blind were founded. In Gotha and Weimar children were boarded in families. The schemes adopted were, however, at that time impracticable and many were even demoralizing. Wages below a certain minimum were made good, though it was obvious that employers would lower wages to take advantage of this fact. The period of the wars also had a depressing effect. During the first thirty years of the nineteenth century begging increased. New laws were promulgated in Saxony in 1840, and in Prussia in 1842. The general law of 1870 affecting the German States, with the exception of Bavaria and Alsace-Lorraine, opened the way for the development of the poor relief of the different States according to local conditions. The Elberfeld system (q.v.) has found general adoption. This is in essence a combination of public and private charity, with unpaid visitors assigned to special districts, who investigate each case, and the treatment is adapted to individual needs. There has likewise been a development of private associations. The Inner Mission (q.v.) has reintroduced the Church care for the poor and the churches are beginning to organize, as is shown by the proceedings of the Eisenach Conference of 1892. The Catholic Church has also been active, this Church in general opposing poor relief by the State or at most merely admitting the right of the State to supplement private efforts. Germany has taken steps to do away with pauperism by the introduction also of compulsory insurance and old-age pensions (q.v.).

In Catholic countries the State has never assumed the leading rôle in poor relief. At Ypres in 1525 reform measures were introduced which raised a storm of religious opposition and were never fully carried out, although the Sorbonne ratified them. The Council of Trent took the old attitude, but in spite of this some princes attempted the supervision of hospitals as within their executive rights. There was, however, a great development of charitable institutions under the Church. A Portuguese, Juan de Dio (1556), founded the Brothers of Charity and the modern hospitals, while Vincent de Paul is justly honored for his philanthropy and for the establishment of the Order of Sisters of Charity.

France has been the seat of the greatest development of the charity of the Church. The administration of relief has been largely through the Church, though some of the funds have been supplied by the State. Francis I. ordered each church to care for its poor, the poor relief to be in the hands of the pastors and assistants, the funds to be derived from free-will offerings. In Paris (1544) a general poor office was created with power to levy a tax, and this tax was extended to all communes in 1566, which plan was followed until 1791. Edicts against begging were numerous and the penalties often severe, but to no purpose. Under the influence of Francis de Sales and Vincent de Paul many institutions were founded, and Louis XIV. also was noted for his efforts in this direction. To supplement the hospitals, dépots de mendicité were established in 1774, and in 1808 these were extended to each province, but they have since largely disappeared. In these labor was compulsory. In spite of the 2185 hospitals with an income of 38,000,000 francs listed by the comité de mendicité, in 1790 pauperism was a live question in France. By the time of the Revolution there was a strong demand for a reform of the poor relief system. The Constitution of 1791 established the principle of State control, and that of 1793 proclaimed that "Society owes its unfortunate citizens support by offering work and by maintaining those incapable of providing for themselves." It was proposed to acquire the private institutions. Necker initiated new measures, opening, among other things, workshops in Paris, which but served to attract the poor from the country, and thus increased the trouble. During the following years many schemes were inaugurated, but the net result was rather to cripple the old system than to establish anything enduring in its place. The Church came again to control, subsidized by the State. The Sisters of Charity regained strength. In 1796 local boards (bureaux de bienfaisance) were established, but were not made compulsory. They exist to-day in only about one-third of the communes whose population is less than 500, and in perhaps two-thirds of those with a population of over 1000. Relief given is both at home ('secours à domicile') and in the institutions. Most of the relief is in the hands of the Church and the right to State relief is not admitted, though in recent years there are signs of opposition to management by the Church. The State has assumed charge of the work for children and for the insane. The Revolution found large numbers of foundling asylums (q.v.), and these increased until 1834, when restrictions were imposed, and instead of the reception through the 'tours' bureaus of admission were formed and the care of the children regulated. In 1869 a special department of the Gov-

ciement was set aside for this work, and in 1874 extensive regulations relative to the boarding of children in private families were adopted. Since 1895 the law regulating medical care of the poor has made some changes, though effective institutions are lacking. The cost of public charity has greatly increased, but this is largely accounted for by the improved care given the poor rather than by great increase in the number of the dependent.

In Italy the mediæval system is most pronounced. Begging is almost universal, and there is little State control of pauperism. The law of 1862 (legge della opere pie), modified in 1890, established some State supervision over charitable corporations, but further development has been checked by the political situation. There are numerous institutions and endowed charities with funds aggregating $4,000,000 or more.

In Austria poor relief is chiefly administered through the communes under the leadership of the priests. The system is known as the Pfarrarmen Institute (1782). The funds are obtained largely from private donations, and each commune supports its own poor, though there is no special tax for the purpose. In Lower Austria the Elberfeld system has been introduced since 1893, with some local taxation in case of emergency. Switzerland supports the helpless and provides work for the able-bodied pauper. After the freeing of the serfs Russia turned poor relief over to the local representative assemblies, which impose taxes for this purpose. In Norway and Sweden public charities are administered by the Established Church. Belgium has almshouses with compulsory labor. Holland has a system of pauper or labor colonies (q.v.), which has won general favor. There exist also over 4600 associations for poor relief, many orphan asylums, and other institutions. In addition there are large numbers of private organizations and institutions.

Long before the Reformation England had unsuccessfully forbidden begging. No provision was made for the destitute until 1388 (12 Richard II.). In 1536 (27 Henry VIII.) each parish was ordered to care for its poor and provide work for the able-bodied. It soon became necessary to induce the people to give money for this purpose, and at first the bishop was to use 'charitable ways and means' to persuade the unwilling donor. In 1563 it was decreed that the persistent refusal to give would bring one before the courts for punishment. A decade later a tax was levied for the poor, and public officials, overseers of the poor (q.v.), were created. In 1601 the famous law of Elizabeth (43 Eliz., c. 2) was enacted and became the basis of subsequent public poor relief in England and the United States. Emphasis is laid upon the 'setting to work' of the able-bodied. The overseers were given power to assess, collect, and distribute the 'rate,' as the tax was called. They cared for and apprenticed orphan children. The unwillingness of any parish to support the poor of other parishes led in time to the development of strict settlement laws (14 Charles II., c.12). Insistence upon 'setting to work' of the able led to the establishment of the workhouse (then called the industrial house). The first one was founded at Bristol in 1697. In 1722 a general act (9 George I., c. 7) authorized workhouses wherever needed. Any pauper refusing to go to the workhouse was denied assistance elsewhere. This gave rise to the distinction made in England and elsewhere between assistance given in an institution, technically called 'indoor relief,' and that given at the residence of the recipient or outside of any public institution, 'outdoor relief.' The introduction of the new institutions naturally gave rise to many abuses, and these, with the general humanitarian sentiment of the eighteenth century, tended toward a reaction. Under Gilbert's act of 1782 the workhouses were largely given over to the old, the infirm, and to children, others receiving assistance outside of the institutions. Various parishes were allowed to form workhouse unions. By an act of 1796 'outdoor relief' was again legalized. The famous Speenhamland Act, adopted in Berkshire in 1795, started the 'allowance system.' A certain minimum of wages was considered necessary, and the difference between this and the amount actually earned was to be supplied by the State. This was extended by the act of 1796. The expenditures for the relief of the poor rose from about £2,004,000 in 1775 to £4,267,000 in 1802, and to £7,890,000 by 1818. Such a rapid increase called for investigation. A commission authorized by Parliament, after a thorough investigation (1832-34), made a remarkable report (1833-34) showing a deplorable condition of affairs. Pauperism seemed to be contagious, and in some districts nearly all the able-bodied men were receiving allowances. In 1834 (4 and 5 William IV.) radical reforms were introduced. Outdoor relief was gradually withdrawn and limited as far as possible. Able-bodied men were refused assistance outside the workhouse. The population of the workhouses was classified. The sexes were separated and only plain necessaries of life were provided. The functions of overseers had already been restricted to the collection of rates, and the distribution of relief had been given to boards of guardians. This arrangement was continued. A central body of commissioners was created, which became in 1847 the Poor Law Board. This body was abolished in 1871 and its powers were lodged in the Local Government Board, which is now the body controlling the general execution of the Poor Law in England and Wales. The results have been satisfactory. New unions were formed. Conditions within the workhouses have improved. Many children have been educated in the special workhouse schools, but there is a growing tendency to send them to the regular parish schools. In many districts children are boarded out in private families. When children are ready to support themselves they are apprenticed in various trades. The workhouses of the first half of the nineteenth century have grown into numerous special institutions for the insane, blind, and deaf and dumb, so that the workhouse of to-day is not the general dumping place of the infirm and unfit. The following table, drawn from statistical reports, shows the expenses of the public relief and the number assisted.

The total sum raised by taxes during these three periods was £12,677,306, £15,087,258, £19,428,912 respectively, the sums actually given in relief rising from £7,747,947 to £8,316,411 and £9,249,724. The costs of administration have properly increased, and it is to be noted that more persons are assisted in institutions, fewer outside, while the total number has slightly increased.

ENGLAND

	Adult able-bodied poor		Other poor		Total assisted	Per cent. of population
	In institutions	Outside	In institutions	Outside		
1871–75*	23,639	116,525	131,753	647,049	918,966	3.93
1881–85*..	24,795	79,866	164,412	522,628	791,701	2.96
1891–95*	34,765	72,515	167,948	511,926	787,144	2.65

* Yearly average.

This means that those assisted probably receive better care than formerly.

England has also witnessed a great development of private charity, of which little mention can be made here. The Friendly Societies (q.v.), the Charity Organization Society, the Salvation Army, and Dr. Barnardo's great work for children deserve mention. Attempts to prevent pauperism have been made in cities by the destruction of slums, the building of tenements, and the opening of parks and playgrounds. Public attention has been directed to the question of old-age pensions (q.v.). The postal savings banks (q.v.) have been successful.

Scotland and Ireland have public relief patterned after that of England. In Scotland no relief is allowed to able-bodied adults. The relief is given by inspectors appointed by the parochial boards, which are under the oversight of the board of supervision.

Public relief of the destitute in the United States is based on the Elizabethan law of 1601. The public duty to give relief is recognized. How this relief shall be administered is a matter for each State to determine. There is little uniformity. At first the almshouse, or poorhouse, was the only institution for the pauper. This was maintained by the town in New England, the county elsewhere. Many of the larger cities had and still have their own institutions. Here have been intermingled the worthy poor, the sick, insane, feeble-minded, children, mothers with illegitimate children. The nineteenth century witnessed the gradual development of hospitals for the insane, which can now provide for about 75 per cent of the insane who are public charges; of institutions for children in such numbers that there is no longer any excuse for the presence of children in almshouses; of hospitals for the sick; of schools for the deaf and dumb and blind; of schools for the feeble-minded; and, in the last decade, of special institutions for the epileptic. Reforms have usually been initiated by private organizations and then been adopted by the State, which has sometimes subsidized private institutions. There is a growing tendency, however, for the State to own and manage all institutions which shelter public charges. Outdoor relief is administered by township trustees under the County Board of Supervisors (in New England the town is the unit) in rural districts. The large cities usually are independent of the county. Chicago is a notable exception. Many cities grant outdoor relief, but some, such as Philadelphia and New York, do not. Mendicancy and vagrancy are forbidden by laws and ordinances, but these are not always enforced. Little attention has been paid to settlement until recently. Now some States are beginning to make inquiries and to send home those who are not properly dependent on them. In most States there is a public body, known usually as the State Board of Charities, which oversees the working of the charitable institutions of the State. Its members, with the exception of the secretary, who devotes his entire time to the work, are usually unpaid. Recently a few States have established a Board of Control, a smaller body of paid agents, to supervise institutions, and sometimes to purchase their supplies. Destitute aliens are a State charge. Immigration of persons likely to become public charges is forbidden by Federal laws.

The United States has witnessed a great development of private beneficence. Most of the churches have funds for the relief of poor members, and there are large charitable institutions under denominational management. The growth since 1870 of the Charity Organization Society has helped to bring order out of the chaos in private relief. One of the chief aims of this society is to coördinate various agencies and to prevent a duplication of effort. Since 1874 the National Conference of Charities and Correction, composed of philanthropists and workers in charitable and correctional institutions, has held annual meetings for the study of pauperism and allied topics, and its publications are valuable. See CHARITIES AND CORRECTION, NATIONAL CONFERENCE OF.

There are no accurate statistics of paupers in the United States. The census of 1890 gave the number of inmates of almshouses as 73,045, but this is generally conceded to be at least 10,000 short of the actual number. To these 'indoor poor' would have to be added the much larger number of persons receiving help who are not in institutions, and the insane and other defectives who are cared for in public institutions, not to mention those supported by private associations.

No attempt has been made to give any comparative statistics of the extent of pauperism in the different countries. The conditions of relief are so diverse, and the census of paupers is so inadequate, that comparative statements are misleading.

Pauperism has no panacea. With every step in human progress a certain proportion of the population, discouraged or overwhelmed by misfortune through the breaking up of old industrial relations when new ones are established, falls behind in the race. Therefore each age and each nation must attack anew the problem of preventing an inevitable destitution from becoming a hopeless pauperism. Certain fundamental principles, however, have been well established by experience, and may thus be summarized:

(1) Indiscriminate almsgiving, without careful investigation of the situation and needs of the applicant, is a fruitful cause of pauperism instead of a remedy. (2) To remove the cause and to bring the individual to self-support, if possible, must be the aim of all efforts; and (3) to accomplish this doles are not sufficient, but

carefully worked out plans must be adopted and carried through. (4) This necessitates an endearing organization of experts (either private or public) to superintend and execute the chosen methods. If success is to be obtained, the various charities must work in coöperation with this central body to prevent imposture and duplication of efforts. (See CHARITY ORGANIZATION SOCIETY.) (5) The assistance given must be sufficient, but not enough to tempt the self-supporting workingman to surrender his independence. (6) In the words of Malthus: "It is in the highest degree important to the general happiness of the poor that no man shall look to charity as a fund upon which he may confidently depend." (7) Beggars should be put in institutions with labor adapted to their abilities. (8) Constructive efforts, such as the creation of family pride, assistance in securing work, removal of children from demoralizing surroundings, pay far better than any palliative measures. (9) The questions as to the sort of relief, in money or in kind; the agency, whether private or public; the place, whether at home or in institutions, are matters to be determined by local antecedents and local conditions. (10) For the physically or mentally feeble there must be furnished good care under decent surroundings—that which constitutes good care naturally varying from place to place and time to time. (11) It is recognized as desirable, no matter what system of relief prevails, that there should be voluntary, unpaid coöperators to lessen the danger of officialism.

BIBLIOGRAPHY. The books and articles treating of pauperism are almost numberless. Reference is made only to a few of the more important sources.

ANCIENT AND MEDIEVAL. Monnier, *Histoire de l'assistance publique* (Paris, 1866); Hirschfeld, *Die Getreideverwaltung in der römischen Kaiserzeit* (Göttingen, 1869); Moreau-Christophe, *Du problème de la misère et sa solution chez les peuples anciens et modernes* (Paris, 1881); Ratzinger, *Geschichte der kirchlichen Armenpflege* (Freiburg, 1884), written from a Catholic standpoint; Uhlhorn, *Die christliche Liebesthätigkeit in der alten Kirche* (Stuttgart, 1880; Eng. trans. Edinburgh, 1883); id., *Die christliche Liebesthatigkeit im Mittelalter* (ib., 1884); id., *Die christliche Liebesthatigkeit seit der Reformation* (2d ed., ib., 1895).

MODERN EUROPE. Emminghaus, *Das Armenwesen und die Armengesetzgebung in den europäischen Staaten* (Berlin, 1870; Eng. trans., London, 1873); Rocholl, *System des deutschen Armenpflegerechts* (Berlin, 1873); Reitenstein, *Die Armengesetzgebung Frankreichs* (Leipzig, 1881); Du Camp, *La charité privée à Paris* (Paris, 1886); Böhmert, *Das Armenwesen in 77 deutschen Städten* (Dresden, 1886); Hubert-Valeroux, *La charité avant et depuis 1789* (Paris, 1890); Bodio, *Atti della commissione reale per l'inchiesta sulle opere pie* (Rome, 1895).

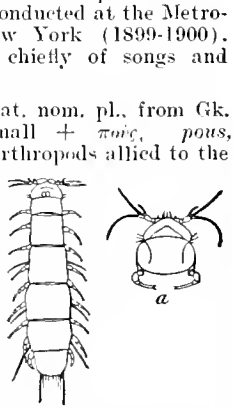
ENGLAND. Nicholls, *History of the English Poor Law* (London, 1854; vol. iii. by Mackay, ib., 1899); *Extracts from the Information Received by His Majesty's Commissioners as to the Administration and Operation of the Poor Laws* (ib., 1833); Ribton-Turner, *History of Vagrants and Vagrancy* (ib., 1887); Booth, *In Darkest England and the Way Out* (New York, 1890); Booth, *Life and Labor of the People* (London, 1891); id., *Pauperism and the Endowment of Old Age* (ib., 1892); id., *The Aged Poor in England and Wales* (ib., 1894); Rowntree, *Poverty* (New York, 1902).

UNITED STATES. Warner, *American Charities* (New York, 1894); *Report of the Special Committee on Outdoor Alms of the Town of Hartford* (Hartford, 1891). This account of American conditions is unique in the American literature of the subject and ranks in value with the *Report of the Poor Law Commission* of 1833-34. Dugdale, *The Jukes* (New York, 1888), a valuable history of one pauper family; National Conference Charities and Correction, *Annual Reports* (Boston, 1874 to date); Brace, *The Dangerous Classes of New York* (New York, 1880). Census of 1890, statistics regarding almshouses, etc.; also reports of various State conferences of charities.

GENERAL. Conrad, *Handwörterbuch der Staatswissenschaften* (Jena, 1898), articles under title "Armenwesen." The subjects treated by the various authors are Introduction; History of Public Poor Relief; Poor Laws of various countries; The Care of the Poor; Poor Rates; Statistics of Pauperism. Each section contains a good bibliography, and the articles here given form by all means the best and most complete study of the subject for the purposes of the general reader. See CHARITIES; MENDICANCY; OLD-AGE PENSIONS; POOR LAWS.

PAUR, pour, EMIL (1855—). An Austro-American musician and conductor, born at Czernowitz. After preliminary instruction under his father he became a student at the Vienna Conservatory, and subsequently held many important appointments. In 1876 he was kapellmeister at Cassel, and in 1880 principal Court kapellmeister and conductor of the Mannheim subscription concerts. He was director at the Leipzig Stadt Theater in 1891, and two years later was called to Boston, as the successor of Nikisch of the Boston Symphony Orchestra. He became conductor of the New York Philharmonic Society concerts in 1898, and the following year succeeded Dvořák in the directorship of the National Conservatory. He conducted at the Metropolitan Opera House, New York (1899-1900). His compositions consist chiefly of songs and chamber-music.

PAUROP'ODA (Neo-Lat. nom. pl., from Gk. *παῦρος*, *pauros*, little, small + *πούς*, *pous*, foot). A small group of arthropods allied to the 'thousand-legs' (Diplopoda.). The few species known are minute, the body behind the head composed of 12 segments, which on the back are represented by six plates. They differ from the Diplopoda in having but a single pair of legs to a segment. The order is represented by *Pauropus Lubbockii* in the Eastern United States and Chile, and by a flattened broad form, Eurypauropus, found in the United States and Europe. The species are cosmopolitan and represent an ancient type. Consult Kenyon, "Morphology and Classification of



PAUROPUS LUBBOCKII.
a, Front view of head.

the Pauropoda," in *Tufts College Studies*, No. 4 (Somerville, Mass, 1895).

PAUSA'NIAS (Lat., from Gk. *Παυσανίας*) (?-c.469 B.C.). A son of Cleombrotus, and regent of Sparta as guardian of his cousin, Plistarchus, the son of Leonidas. He commanded the Greeks in the battle of Platæa, B.C. 479, in which the Persian army under Mardonius was overwhelmed, and eleven days later, marching to Thebes, demanded of that city the surrender of all who had been traitors to the Greek cause. After a siege of twenty days, the Thebans yielded. In B.C. 477 there was put under his command a fleet of the confederate Greeks, wherewith to drive the Persians from the islands and coast-towns, and with this he took Cyprus and Byzantium. Elated by these victories and puffed up with pride and ambition, he entered into secret negotiations with the Persians, with the view of becoming ruler, subject to the Persian monarch, of the whole of Greece. Meanwhile, he treated the allies as though he were their lord and sovereign, adopted Persian dress and manners, protected his person with a bodyguard of Persians and Egyptians, and introduced into his household habits of Oriental luxury. Being recalled by the authorities at Sparta, he was acquitted on the main charge of treason, and again returned to the Hellespont to renew his intrigues with the Persians. He was a second time summoned home and arraigned, but was a second time acquitted. He now, while still continuing his negotiations with Xerxes, began also to intrigue with the Helots, promising them freedom and citizenship if they would rise and overthrow the government. At last he was betrayed by one Argilius, whom he had commissioned to carry a letter to the Persians. Argilius, noticing that no one of those previously sent on a similar errand had ever returned, opened the letter, found directions therein for his own death, and laid the matter before the ephors. Pausanias, finding his plot discovered and himself entrapped, took refuge in the temple of Athene Chalcioecus. Hereupon the people blocked up the entrance with a pile of stones, the first stone being laid by his aged mother, and left him to die of hunger. This was about B.C. 469. Consult the histories of Greece by Grote, Curtius, Abbott, Holm, Beloch, and Meyer.

PAUSANIAS. A Greek traveler and geographer, author of Ἑλλάδος Περιήγησις, *Hellados Periēgēsis*, or Guide-book to Greece. Of his early life little is known. He was probably a native of Lydia in Asia Minor, and was certainly at work on his book as late as A.D. 175, though the earlier part seems to have been published some years before. His work, in ten books, is a detailed description of what seemed to him the most important places and monuments in Greece, arranged by districts and in much of the work described in a most systematic fashion. His interest is largely religious, and while other buildings are mentioned, the chief space is devoted to temples and lesser shrines, often with interesting and curious details as to local traditions and ceremonies. In general, he pays little attention to recent art or buildings, reserving his admiration for the great works of the fifth and fourth centuries B.C. The dry details of topography are relieved by historical digressions, often of no great accuracy, anecdotes, and legends. The style is dry and often obscure, and the manuscripts are not infrequently defective. In spite of its undoubted weaknesses, the book is an invaluable source not merely for the topography and monuments, but for the local cults, and its value increases with new exploration. For his history Pausanias of course depended on his predecessors, and for traditions and descriptions he seems to have used earlier material: but there is no good reason to doubt that his work represents personal travel and investigation, and its general accuracy is confirmed by recent discoveries. There are a number of early editions of Pausanias, but the best complete text is that edited by J. H. C. Schubert (Leipzig, 1853-54, often reprinted); a new edition with critical and explanatory notes by Hitzig and Blümner is in course of publication (Leipzig, 1896 et seq.); the fullest commentary is by J. G. Frazer, *Pausanias' Description of Greece*, translated with commentary (6 vols., London, 1898); valuable for Athens is Jahn-Michaelis, *Arx Athenarum a Pausania Descripta* (3d ed., Bonn, 1901); Harrison and Verrall, *Mythology and Monuments of Ancient Athens* (London, 1890). For the criticism of Pausanias, consult: Kalkmann, *Pausanias der Perieget* (Berlin, 1886); Gurlitt, *Pausanias* (Gratz, 1890); Heberdey, *Die Reisen des Pausanias in Griechenland* (Vienna, 1894).

PAUSIAS, pâ'shi-as (Lat., from Gk. *Παυσίας*). A Greek painter of the first half of the fourth century B.C., a pupil of Pamphilus and a contemporary, if not a fellow-student, of Apelles. He was a great decorative artist, especially in encaustic, and was reputed the first to paint ceilings, setting within garlands and wreaths small genre pictures, especially of children. His famous painting of Glycera, a flower girl of his native city, Sicyon, and probably his mistress, showing her with a garland in her hair, or a copy, was sold to Lucullus for two talents. His skill in foreshortening made his work prized in Rome, where a black bull at the altar, head to the front, and with such clever perspective that the length is easily guessed, was one of the great pictures in the portico of Pompey's Temple.

PAUSINGER, pou'zing-ĕr, FRANZ VON (1839—). An Austrian landscape and animal painter, born at Salzburg. He studied at the Vienna Academy, then under Schirmer at Karlsruhe, and under Rudolf Koller at Zurich, where he developed that keen observation of animal life, especially of the larger kinds of game, which presently brought his faithful delineations of it into great favor with sportsmen. In 1881 he accompanied Crown Prince Rudolph of Austria on his trip to the East, and afterwards supplied the illustrations to the Prince's work describing that journey. His best known pictures include: "Beechwood in the Glow of Sunlight" (1873, Vienna Museum); "Stag Fighting Dogs" (1877); "Red Deer at Feeding-Trough in Winter" (1888); "Stag Attacked by Wolves" (1893).

PAUW, pou, CORNELIS VAN (1739-99). A Dutch author. He was born at Amsterdam and educated at Göttingen. He joined the Order of Franciscans and became canon of Xanten in the Duchy of Cleves; was afterwards appointed reader to Frederick II. of Prussia. He declined

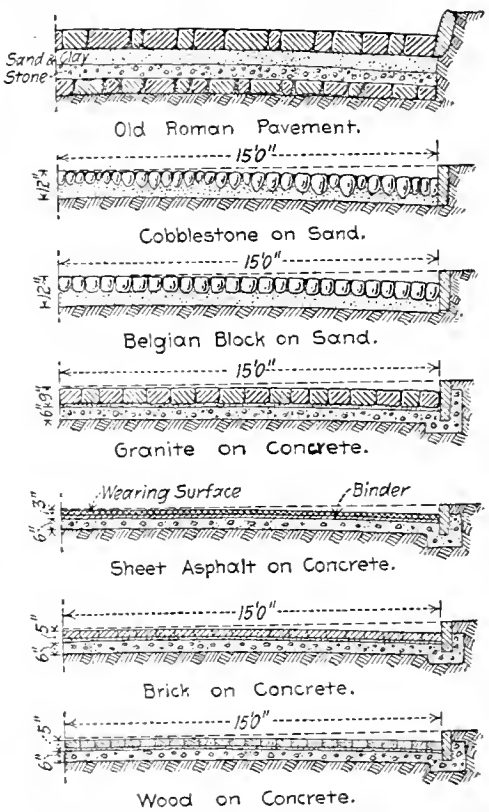
face of an academician of Berlin and a bishop at Breslau. He published *Recherches philosophiques sur les Americains* (1768-70; enlarged editions, 1770 and 1774); *Recherches philosophiques sur les Egyptiens et les Chinois* (1774); *Recherches philosophiques sur les Grecs* (1788). These works were translated into English (Rochdale, 1806; London, 1795, 1793 respectively). They contain curious information, but many unproved assertions made in a dogmatic spirit.

PAUWELS, pou'els, FERDINAND (1830—). A Belgian historical painter. He was born at Eeckeren, near Antwerp, April 13, 1830, and studied at the Academy of Antwerp, principally under Wappers. His first picture, exhibited in 1851, was the "Meeting of Baldwin I. with His Daughter Joan at Constantinople in 1206." His "Coriolanus" gained him the Roman prize. He remained four years at Rome. Upon his return to Antwerp he achieved fame with his "Widow of Jacob van Artevelde" (1857, Brussels Museum) and "Banished by Alva" (1861). From 1862 to 1872 he was professor in the Art School at Weimar, and painted, besides other pictures, the "Reception by Louis XIV. of a Deputation from the Doge of Genoa" (1864, Maximilianeum, Munich); "Queen Philippa of England Relieving the Poor of Ghent" (1866); and several mural paintings in the Wartburg, illustrating the history of Luther. He returned to Antwerp in 1872, and finished the historical cycle of wall paintings by Groux in the Cloth Hall of Ypres. In 1876 he became professor at the Academy of Dresden, which position he resigned in 1901. His later works include: "Count Philip of Alsace Visiting a Hospital at Ypres" (1877; Dresden Gallery); "Admonition" (Leipzig Museum); "Christus Consolator" (1893). His style is grandiose, his color luminous, and his figures are full of character.

PAVANE (It. *pavana*, probably a variant of *pavone*, *paone*, peacock; so called from the stately character of the dance; commonly derived, however, from It. *Padvana*, *Padovana*, Paduan, from *Padova*, Padua, as being supposed to be the place where the dance originated). An ancient Italian dance which spread from that country into Spain, thence to France, and eventually to England and Scotland. It was most popular during the sixteenth century, and was especially so in Spain, and at the Court of James V. of Scotland. It was a solemn, stately dance, generally accompanied by a song. The music was always written in even time and the steps were simple and slow, the performers alternately advancing and retreating. There were various modifications of the pavane, the most important being the Spanish, which introduced a number of elaborate figures.

PAVEMENT (OF. *pavement*, *pariment*, Fr. *pavement*, from Lat. *pavimentum*, pavement, beaten floor, from *pavire*, to beat, Gk. *ταίειν*, *paiein*, to beat, Skt. *pavi*, thunderbolt). This term, in its broader sense, includes any firm, hard covering for areas subjected to the wear and tear of human feet, or of hoofs and wheels, designed to keep the feet or wheels from the ground or earth, and to present a more or less dry, durable, and smooth surface. Under this definition would be included the paved floors of cathedrals and other public buildings often of an ornamental character (see TILES), as well as the surfaces of courtyards, walks, streets, and highways, on which stones or other durable materials are placed. In the modern and more restricted sense, pavements are generally limited to the wearing surface of that portion of improved streets lying between the curbs, thus excluding the sidewalks.

The early history of pavements is involved in obscurity. Strabo says Babylon was paved 2000 years B.C., and Livy relates that about B.C. 170 Rome was paved from the ox market to the Temple of Venus. Before the Christian Era the Romans had learned to construct solid and durable pavements, composed of several layers of stone, mortar, and cement, the upper surface being quite smooth. Portions of these early pavements are said to have been in use within comparatively recent times. Excavations at



TYPICAL STREET PAVEMENTS.

Pompeii reveal some of the old Roman streets just as they appeared when the city was destroyed A.D. 79. The stone blocks were large, many-sided, with their vertical edges carefully fitted, the whole resting on a solid foundation, composed of several layers. The material used was lava stone. It is said that the streets of Cordova, in Spain, were both paved and lighted as early as A.D. 950, under the Caliph Abderrahman III., but most mediæval cities were unpaved until about the twelfth century, and nearly all pavements from that time on until well into the nineteenth century were of rude construction, cobblestone being a common material.

Paris first had pavements, it is believed, about 1184, when its population was estimated at 200,000. In 1698 the pavements of Paris were described as being "of square stones of about eight or ten inches thick; that is, as deep in the ground as they are broad on top." Tillson says that the English Parliament ordered the London Strand paved in the fourteenth century, but adds: "It is said that the first regular pavements were laid in 1533, when the city had a population of 150,000. Holborn had some pavements in 1417. Square granite blocks were introduced by acts of Parliament for Westminster in 1761, and for London generally in 1766." In the United States, cobblestone pavements were laid as early as 1650, or thereabouts, in both Boston and New York.

During the second quarter of the nineteenth century the cities of both Europe and America began to look about for better pavements and to experiment with stone and wood blocks, and (in Europe) with asphalt. From 1850 to 1875 bricks were tried in America. During the period from 1875 to 1900, and more particularly from 1890 to 1900, the theory and practice of street paving was put on a more satisfactory basis than ever before, and thousands of miles of new pavements were laid.

Asphalt was first used in Paris in 1838, but not on a large scale until 1854. It was introduced in London in 1869. In both these cities the material was rock asphalt. What is believed to have been the first asphalt pavement in the United States was laid in Newark, N. J., in 1870, by E. J. de Smedt. In 1871 some asphalt was laid in New York and a little later in Philadelphia. The material in each of these three cases was Trinidad asphalt. In 1876-77 both rock and Trinidad asphalt were laid in Washington. The good results obtained in that city led to the rapid introduction of asphalt there and elsewhere, but comparatively little rock asphalt has been laid in America.

Brick was used to pave roads in Holland as early as the seventeenth century and has been used extensively for both roads and city streets since. Brick pavements are said to have been used in Japan for more than a hundred years. The first brick pavement on a roadway in the United States was laid at Charleston, W. Va., in 1870, and in 1873 the city adopted the system for certain streets. This example was followed by many Central Western cities, but Philadelphia was the first large city to make use of this material, laying some brick roadway pavement in 1887.

Wood blocks were laid in New York as early as 1835-36, and in 1839 wood pavements were already in use in both Philadelphia and Boston, being mentioned in a report made to the Franklin Institute (Philadelphia) by a committee on paving materials. London laid its first wooden pavement in 1839; Glasgow, in 1841; Paris, much later.

Stone blocks of the modern type, of 3 × 9 inches, granite, with mortar joints, were laid on Blackfriar's Bridge, London, in 1840. Glasgow laid granite blocks in 1841. A concrete foundation was used in London, the first in that city, in 1872, and tar and gravel joints were employed in both London and Liverpool about the same time, although used in Manchester, England, prior to 1869. Prior to 1849 scarcely any pavements but cobblestone were used in New York. About 1850 the Belgian blocks were introduced. Granite blocks similar to those now used were introduced in New York about 1876, succeeding some much larger blocks, known as the Guidet patent. Concrete foundations for stone pavements were not used regularly in New York until 1888. Large stone blocks were used in Saint Louis as early as 1818, being from three to 12 inches thick, 6 to 14 inches long, and 6 to 10 inches deep, set on 6 inches of sand. In 1842 stone blocks of about the present size and shape were used in Saint Louis.

In America the pavements now being laid are principally asphalt, brick, and stone block.

Rock asphalt is used to some extent in London, Paris, and other European cities, and stone blocks are common. Brick does not appear to have gained the footing in Europe that it has in America. There is still another sort of improved street surface which is very common on roads and on streets of light traffic throughout the United States, Canada, Great Britain, and at least the western part of Continental Europe, namely the compacted broken stone, known as macadam or telford. See ROADS.

Foundations are to pavements what floors are to carpets; or, conversely, the visible parts of pavements are but the wearing surfaces of streets. Failure to recognize the importance of good foundations has been the bane of most American and many foreign pavements. If the foundation yields, through deficient drainage or bad material and workmanship, the destruction of the pavement follows. In some soils natural drainage is ample. Where it is not, either a drain in the centre or at one or both sides of the street is required to remove the subsoil water. These drains may be of stone, tile, or sewer pipe, according to the relative cheapness of the several materials in the locality concerned and the character of the drainage work. Drainage provided, and the surface on which the pavement is to be laid shaped and compacted, the foundation is next put in place. For serviceability nothing surpasses concrete as a foundation. The chief argument against it is its cost, which may range from 50 cents per square yard upward. The thickness of the concrete should rarely be less than six inches, and may run as high as ten inches. Sometimes broken stone, alone, is used for foundation, and again stone, brick, or wood is laid directly on sand.

If the traffic is not heavy, sand, gravel, or broken stone may sometimes be used with a fair degree of success, particularly if the earth beneath is well compacted and thoroughly drained. Asphalt should always have a concrete foundation, except where laid on top of an existing pavement of some other material, which will form a good bed. The finished surface of the foundation should be brought to such a curve, or crown, crosswise of the street, as will shed the rainfall to the gutters. A four-inch crown on a street 30 feet wide is considered good practice. Greater widths should have more crown, but the increase is not necessarily proportional.

Cushion coats, composed of one to two inches of sand, are generally placed on concrete foundations for all materials save asphalt, and also on brick laid flatwise for foundations. They allow the separate blocks or bricks to be brought to a firm bed by ramming or rolling. They also pro-

vid for uneven depths in blocks or bricks, thus aiding in bringing the finished pavement to a true surface.

Fillers are employed to close the joints between blocks and bricks. They are often of some waterproof cement, thus rendering the pavement impervious, as well as binding it together. Where bituminous in character, like asphalt, coal tar, or the two combined, they also yield somewhat to contraction and expansion, without permanent rupture, as is the case with the Portland cement and other burnt stone fillers. *Portland cement filler* is a grout composed of 1 part cement and 1 or perhaps 2 parts fine sand, mixed with sufficient water to cause it to run easily, thus filling the interstices. *Murphy grout* is a patented filler composed chiefly of ground iron slag, carbonate of lime, and sand, mixed with water. *Bituminous* cements are many and variable, but may be classed as coal-tar pitch and asphalt. Residuum oil (obtained in the refining of petroleum) is generally, but not always, used with asphalt cements. (See ASPHALT.) Coal-tar pitch alone becomes brittle and cracks or breaks in winter, while in summer it becomes hot and flows. It is designated commercially by the degree of hardness to which it has been distilled. In and near New York it is common to mix 100 pounds of No. 4 coal-tar pitch (commercially known as paving cement), 20 pounds asphalt, and 3 pounds residuum oil. This last combination is used with hot gravel to fill the joints in block stone pavements. Where asphalt is used, some 10 per cent. of its weight in residuum oil is sometimes added. All the bituminous cements are poured hot. Sand alone is also used as a filler, but not where imperviousness is desired.

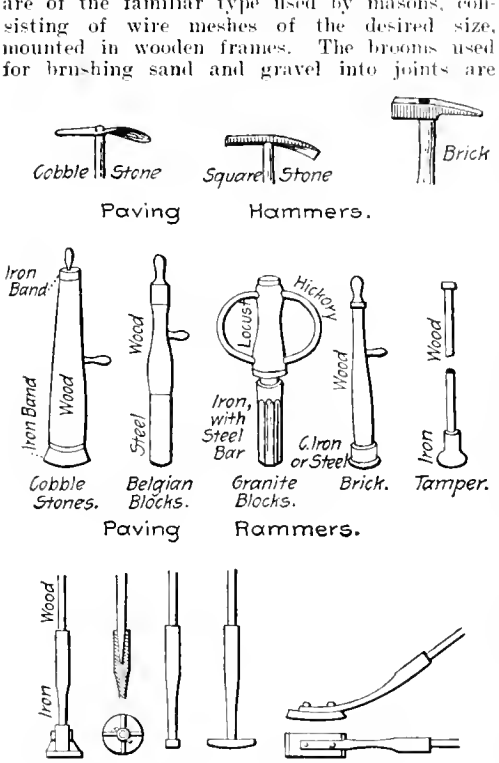
Ramming is employed on stone, wood, and brick pavements to bring the blocks or bricks to a firm bed and even surface. Rolling with steam or other rollers is a necessity with sheet asphalt and is sometimes done with other pavements.

CHOICE OF PAVING MATERIALS depends on a variety of factors, such as serviceability, durability, cost of construction, repairs, and maintenance, ease of cleaning, noiselessness, and other sanitary or related qualities. Under serviceability, the main factors are a minimum resistance to traction and a good foothold for horses, or absence of slipperiness. Asphalt fulfills the first of these conditions most admirably, and probably brick comes next. Asphalt is slippery, both in wet weather and on heavy grades. Brick is less slippery. Newly laid wood gives a smooth pavement, but it is liable to wear unevenly and to be slippery in wet weather. For durability, or long wearing powers, the best stone blocks cannot be excelled, and under heavy traffic they are very serviceable, although offering more resistance to traction than several other materials. In first cost, asphalt and the best stone blocks generally rank high; but this is largely offset by their durability and low cost of repairs. Brick pavements are very cheap in some localities, and if placed on good foundations they are sufficiently durable. Wood may be cheap also, but unless specially treated wood is used it generally proves expensive to keep in repair and requires frequent renewals. For ease of cleaning nothing can surpass asphalt, and it gives rise to less noise than either stone blocks or brick. Brick is also easily cleaned, and far quieter than stone blocks. The latter are not only noisy, but also hard to clean, and unpleasant to ride over, on account of their roughness. The smoothness of asphalt and brick, and the quickness with which their surfaces dry after a rain or a sprinkling, make them great dust-spreaders, but the ease and thoroughness with which they may be cleaned render an avoidance of this nuisance comparatively easy. The large joints of stone blocks collect and retain dirt, but, as it is next to impossible to clean all of it from between the stones, it dries and spreads when subjected to the sun and wind. The dampness of wood pavements is one of the chief objections urged against them. They absorb unclean water readily and tend to keep the streets in a slimy condition, particularly in moist climates and on streets not freely exposed to the sun and wind.

COST of pavements varies widely with local conditions, particularly the depth and character of the foundations, the kind and quality of the wearing surfaces, the inclusion (or absence) in the contract of maintenance guarantees, and the freight rates. The variations are even greater when the cost of grading is included. For comparative purposes the cost of grading, draining, and curbing should be omitted; and the maintenance guarantees, if any, should be described. In fact, without full details relating to the various factors involved, comparative figures of cost are often worse than useless. Roughly, the cost per yard of asphalt and granite was, in 1900, about $2.25 to $2.75; brick, $1.50 to $1.75; all for American cities, and excluding both extremes. With sand foundations and second or third class work the prices would be less, but the tendency is to insist on concrete foundations and good work generally for all three kinds of pavements, asphalt, granite, and brick ranking in the order named in this particular. The best wood pavements, on concrete, cost about the same as brick. The *life* of pavements, or the period for which they may be used without renewing the wearing surface, is given by Tillson as follows: granite blocks, 25 to 20 years; Belgian blocks, 20 years; asphalt and cobble, each 18 years; brick, 15 years; wood, 10 to 15 years; macadam, 8 years.

TOOLS for paving work include hammers, rammers, tamping irons, crowbars, sand and gravel screens, and brooms, besides special asphalt tools and machinery and a variety of tools and machines common to road and other work, such as rollers and concrete-mixers. The graders, scrapers, and other apparatus used in preparing the earth sub-grade, and also the rollers used to compact the natural earth and various classes of paving material, will be described under ROAD AND STREET MACHINERY. Concrete-mixers are described under CONCRETE. Pavers' hammers have a head at one end for pounding the blocks, and a sort of combination chisel and scoop at the other, to facilitate the preparation of the sand cushion and to pry out or loosen single blocks in the setting. Different-shaped hammers are used for cobble than for squared stones, and still different ones for brick. Rammers, also, vary in shape and weight, according to the character of the blocks for which they are designed. For stone, the weights are 40 to 45 pounds; for brick, 25 to 30 pounds; for earth, about 20 pounds. Several shapes of tamping irons are used for street asphalt, to facilitate work along curbstones and to meet other spe-

cial needs. These rammers have cast-iron heads and wooden handles. The smoothing irons are of the same materials, but are slightly convex to the pavement, and are mounted on handles curved at the lower end. Both the tamping and smoothing irons are heated in fire-boxes, mounted on wheels. Screens for sand and gravel are of the familiar type used by masons, consisting of wire meshes of the desired size, mounted in wooden frames. The brooms used for brushing sand and gravel into joints are



TOOLS USED IN STREET-PAVING.

short and stiff, of rattan, wood fibres, or wire. The Perkins *surface heater*, used in repairing sheet asphalt, is composed of gasoline burners, surrounded by wire and asbestos cement. The burners are supplied from a gasoline tank mounted on wheels, the same mounting also serving as a support to the burner frame and mat when the heater is being wheeled about. When in use, the burner frame rests on the asphalt pavement, with a small air space below the mat.

ASPHALT PAVEMENTS are divided into sheet and block. *Sheet asphalt* consists of a binder and a wearing surface, the binder serving to unite the foundation and the wearing surface. The binder is composed of small pieces of broken stone, united with asphaltic cement. The mixture is spread on the foundation in a layer sufficiently deep to give the requisite thickness after having been rolled. A final thickness of one inch is considered ample by some, but one and one-half and even two inches is not uncommon. The wearing surface is composed of sand, carbonate of lime (powdered limestone), and asphaltic cement, mixed hot in varying proportions. The object is to use enough powdered limestone to fill the voids in the sand as completely as possible, and enough asphaltic cement to bind the whole together. It is also desired to make the pavement impervious to water. The consensus of opinion is that the wearing surface should contain 9 to 10 per cent. of bitumen and have a final thickness of about two inches. It should be spread on the binder while the mixture is hot, say at a temperature of 250° F. The spreading is effected by men with rakes, who are followed by other men with hand rollers. Next hydraulic cement is scattered over the surface. After this comes first a five-ton and then a ten-ton steam roller. Thus, three rollers are used in succession, the lighter ones first, in order to prevent distortion of the asphalt while soft. Generally, the asphalt is laid clear up to each curb, special care being taken with the gutters, but sometimes brick or stone is used in place of asphalt in the gutters. The need of special precautions here is the danger from the water that gravitates to the gutters. It is claimed for the Alcatraz and Bermudez products that they may be laid in gutters without harm, but some conservative engineers did not regard this as proved up to the close of 1900. Cracks are liable to occur in sheet asphalt subjected to wide variations in temperature. Most of the asphalt pavements laid in America have been composed of Trinidad sheet asphalt, but in recent years both the Bermudez and Alcatraz products have been employed. See ASPHALT.

ASPHALT PLANTS, used to prepare the material for laying sheet asphalt pavements, include melting kettles, sand-heaters, mixers, and various accessories. The asphalt arrives at the plant in barrels. These are cut away and the asphalt and the residuum oil or other flux are heated and thoroughly mixed in the kettles. The mixing may be effected by revolving paddles, or by pumping in air at the bottom of the kettles. The sand is dried and heated in jacketed revolving cylinders, fitted with angle bars to keep the sand well agitated. The drum is set at a slight angle, so the sand will find its way out. It falls into elevators, which take it to a bin on or above the mixing platform. In case pulverized limestone cannot be had in the vicinity of the plant a limestone-grinding mill is provided. All the ingredients being ready, the asphaltic cement, sand, and limestone are admitted to the mixer. This is an iron box, with a capacity of 8 or 16 cubic feet. Two parallel revolving shafts, each fitted with steel blades, and revolving in opposite directions, are placed in the bottom of the box and effect a thorough mixing of the several materials. When mixed, the finished paving material is dumped from the mixer into a cart or wagon and hauled to the street.

ROCK ASPHALT PAVEMENTS are composed of crushed limestone or sandstone, naturally impregnated with bitumen. If the natural product does not have the desired proportion of bituminous matter this is rectified by mixing a richer or poorer rock with the first. The mixture is powdered, sifted, then kept heated for two hours at 300° to 325° F., after which it is carted to and spread upon the street. After a light rolling, followed by hand tamping, the surface is covered lightly with hydraulic cement and rolled with a steam roller. The European rock asphalt pavements are all made from bituminous limestone, but in America both sandstone and limestone bituminous rock are used,

sometimes mixed together. Little trouble from cracking arises with the rock asphalts; they are generally considered more durable and more slippery than the artificial asphalt mixtures. In Paris some of the asphalt pavements are prepared by adding enough bitumen to the rock asphalt to bring the total bitumen up to 15 or 18 per cent. The mixture is heated to such a consistency that it can be spread or floated into a layer about one and one-half inches deep. It is not rolled. Other asphalt pavements in Paris are compressed.

Block Asphalt is formed by mixing crushed trap rock and asphaltic cement at a temperature of some 300° F., and molding the mixture in machines, under a pressure of 120 tons to each block. The blocks measure 4 × 12 inches on the street surface, and are either 3 or 4 inches deep. They are laid much like brick. It is claimed for asphalt blocks that they are made of a uniform composition and at a uniform temperature, always under cover, thus yielding a product of constant quality; also that they are available for use in small places where the erection of a plant for the preparation of street asphalt would be out of the question.

Brick Pavements are composed of tough, hard, non-absorbent brick, designed to withstand the hammer-like blows and abrasive action of hoofs and wheels and to resist the action of water and frost. In size, shape, and general appearance they resemble ordinary building brick, but they are made and burned with more care. (See Brick.) Where feasible, brick should have a concrete foundation. On the latter a two-inch cushion of sand is laid. The bricks are set edgewise on the sand, their lengths running across the street and joints being broken. At street intersections each quarter of the area is laid diagonally, so the length of the brick will be at right angles to the direction of the traffic, when the latter is turning corners. The bricks are rammed to bed them firmly. Such bricks as sink below the surface are replaced with deeper ones. Although the bricks are set in as close contact with each other as is feasible, open spaces remain. Nearly all the fillers described above have been used for brick pavements. Sand is not suitable, as it quickly washes out. There is great difference of opinion as to the relative merits of Portland cement grout and the bituminous fillers. Both kinds of filler are poured over the surface of the pavement and swept into the joints with brooms. After this has been done the pavement is covered with a thin layer of sand. Expansion joints are sometimes provided, both lengthwise and crosswise the streets, the former at each curb line, and the latter at intervals of 25 to 50 feet. They are made by filling a narrow space or spaces between bricks with some form of bituminous cement.

Wood Pavements are composed of blocks of wood, either round or rectangular, laid with the grain or fibre perpendicular to the foundation. The rectangular blocks are most commonly 3 × 9 inches × 4 to 6 inches deep. The round blocks are 4 to 8 inches in diameter, and about 6 inches deep. Blocks of hexagonal and other special shapes have been tried, but experience has shown that the special forms have no advantage commensurate with their cost. The round and the rectangular blocks are sawed to the desired lengths from logs or from plank, respectively, gang saws sometimes being used. The bark, and in some cases the sap-wood, is cut from the round blocks by machinery. The blocks are sometimes treated chemically with creosote or some other wood preservative. Unless this is done it is questionable whether wood should be used for paving purposes. The round blocks necessarily have large spaces between them to be filled; the rectangular blocks are sometimes laid close together and sometimes with spaces. Various fillers are used. Expansion joints are often, but not always, inserted at the curb, of sand, and covered with bituminous cement or other materials. Probably round cedar blocks have been more freely used in America than any other wood. In Europe pine, fir, and more recently Australian hard woods, known as Karri and Jarrah, have been employed. For the best results, wood should be laid on a concrete foundation, but this has seldom been done in the United States. In Chicago round cedar blocks are laid as follows: Not less than two inches of sand is spread over the surface to be paved. On this a flooring of two-inch hemlock plank is laid, supported also at the centre and each end by 1 × 8-inch boards, laid flatwise in the sand. The blocks are set on end on the plank. The spaces between the blocks must be at least three-quarters of an inch, but not more than one and one-half inches in size. The joints are filled with clean, screened dry gravel, thoroughly rammed in, after which the whole pavement is covered with hot coal-tar pitch, and this in turn is covered with three-quarters of an inch of roofing gravel. At Indianapolis rectangular red cedar blocks were laid in 1894 and 1896, and heart-wood Southern yellow pine later on. The first blocks were not treated, but the later ones were creosoted. The blocks were laid on a concrete foundation, with a one-inch sand cushion, and latterly with expansion joints at the curb. The joints were partially filled with fine sand, after which the pavement was rolled, then covered with hot paving pitch and fine gravel. The cedar blocks were five inches, and the pine blocks four inches deep. Since 1900 creosoted wood blocks have been gaining in favor in the United States. Some of the London hard-wood pavements have been of blocks 3 × 9 × 5 inches deep, laid close. At the gutters three courses were laid parallel to the curbs, the blocks having been dipped in a boiling mixture of four parts of tar and one part of pitch, and there being a one-inch sand filled expansion joint at each curb. The main part of the street was covered with blocks laid crosswise. The filling is effected with boiling tar and pitch, first covering the entire surface, then worked into the joints; after which cement grout is floated over the pavement, then sand thrown over all. Soft-wood pavements of the same period in London were not less than six inches deep, creosoted, and had their joints filled with a grout of blue lias lime and sand.

Stone Block Pavements are most commonly of granite, some of the harder and tougher sandstones, and trap rock, the latter being the least satisfactory of the three. The lengths and depths are quite variable in different cities, but in the best work the widths range from 3 to 4 or 4½ inches, with a tendency to 3½ inches in American cities. The governing condition of width is the foothold for horses. Depths should be at

least one and one-half times the narrow and medium widths, to give a firm setting that will prevent rocking on the base. In American cities common dimensions are as follows: Widths, 3½ to 4 inches; lengths, 9 to 12 inches; depths, 6 to 8 inches. In a number of European cities there is a tendency to square or nearly square blocks, approximating 6 inches on a side, with depths of 6 to 8 inches. Square blocks (or Belgian; see below) are also used in the United States, but not frequently of granite, as is the case abroad. The blocks should be as nearly rectangular and flat as is possible on the tops, sides, and ends. The blocks are generally laid crosswise of the street, and diagonally at intersections. A sand cushion is used when the blocks are laid on concrete, as they should be almost invariably, since stone blocks are generally used where the traffic is heavy. The filler most commonly employed for the joints is first gravel, then hot paving cement. Medina sandstone is sometimes laid as close as possible, and filled with asphaltic cement, Portland cement, or Murphy grout. *Belgian blocks*, so named from their use in Belgium, have tops five or six inches square, bottoms somewhat less, but generally not more than one inch smaller each way, and depths of seven to eight inches. These blocks have been extensively used near New York, and trap rock, being plentiful and cheap in that vicinity, has been employed for the purpose. The trap does not break to a true surface readily and is not easily worked, so it is difficult to get good surfaces with Belgian block of this material. It is very durable, but wears smooth and slippery. Belgian blocks are almost if not quite always laid on a sand or earth base, since one of the objects in their selection is cheapness; their joints are filled with sand. Trap-rock blocks are also got out and laid in oblong form, much like granite and sandstone in general outline, but with far less regular surfaces. Limestone has been used for block pavements, but to a small extent, as it is too soft to be durable.

All blocks should be laid diagonally at street intersections, as is done with brick. The securing and dressing of stone blocks does not differ materially from the quarrying and working of other dimension stone. *Cross-walks* are laid at street intersections. They are composed of two parallel rows of bluestone, granite, or sandstone, according to the locality and the kind of pavement, with a row of blocks between. The crosstones are 1½ to 2 feet wide, 4 to 6 feet long, and 6 to 8 inches thick. In the best modern work they are laid with a keystone at the centre of the street, and with diagonal joints each way, at right angles to the direction of the traffic in turning corners.

Cobblestones are seldom used now. Their only merit is low first cost. They are laid with best results on a base of six inches of loamy sand, which gives a firm bedding and tends to hold them tightly in place. They are set on end. The stones should be not less than four inches nor more than eight inches in diameter at the head, not under five inches nor over ten inches deep, and only rounded stones should be used.

Maintenance. The greatest enemy to good pavements is the frequent street openings so common, and often so necessary where subways for pipes and wires are not provided. (See Subways.) All street openings to gain access to pipes and wires should be under the control of the city department responsible for the maintenance of the pavements. Great care should be taken in refilling all trenches, the dirt being thoroughly tamped to prevent future settlement. In America maintenance for a period of years is sometimes included in contracts for pavements, but chiefly for asphalt. The periods are of varying lengths, but generally five to ten years. Maintenance guarantees amount, of course, to a higher contract price for what on its face is original construction, but is really maintenance as well. When the guarantees expire, a contract for maintenance only is sometimes made with the original or a new contractor. See articles on Asphalt; Brick; Concrete; Quarrying; Road and Street Machinery; Roads; Streets.

Bibliography. For American treatises, consult: Byrnes, *Highway Construction* (4th ed., New York, 1900); Tillson, *Street Pavements and Paving Materials* (ib., 1900); and for a briefer and more elementary work, Spaulding, *Roads and Pavements* (ib., 1895). British treatises available are Aitken, *Road Making and Maintenance* (London and Philadelphia, 1900); Maxwell, *Construction of Roads and Streets* (London, 1899).

PAVEMENT ANT. See House-Ant.

PAVET DE COURTEILLE, pȧ'vȧ' de kōōr'tȧ'y', Abel (1821-89). A French Orientalist, born in Paris. He was a grandson of De Sacy and studied under him in the Ecole des Langues Orientales. After four years as instructor in the Ecole Jeunes, in 1854 he became professor of Turkish in the Collège de France. It was in Turkish especially that he made important research. He published: *Conseils de Nabi Efendi à son fils Aboul Khair* (text and translation, 1857); *Histoire de la campagne de Mohâcz, par Kémal Pacha Zadeh* (1859); *Les prairies d'or de Maçoudi* (with Barbier de Meynard, 1861-64); *Mémoires de Baber* (1871); *Miradj Namèh* (1882); *Tezkéreh-i-evliyâ* (1889); and, most important of all, the *Dictionnaire turc-oriental* (1870).

PAVIA, pȧ-vē'ȧ. The capital of the Province of Pavia, Italy, situated on the left bank of the Ticino, two miles above its confluence with the Po, 18 miles south of Milan, with which it is connected both by river and canal (Map: Italy, D 2). An ancient covered granite bridge of seven arches and an iron railway bridge connect the city with the suburb of Ticino, on the right bank of the river. Through the town with its narrow streets runs the Corso Cavour. The city is still mostly surrounded by its old walls, and has an imposing appearance, but bears a sombre impress of antiquity. In former times it was called the 'city of a hundred towers,' but few of these now remain. Some of the edifices are by Bramante. The oldest church is San Michele, a fine example of the Lombard-Romanesque style. The cathedral, containing some good paintings, was commenced in 1486, but was never finished. It is now being restored. In a beautiful chapel attached to it are the ashes of Saint Augustine in a magnificent Gothic sarcophagus. The Certosa di Pavia (q.v.), the most splendid monastery in the world, lies five miles north of the city. Pavia has a famous university with an imposing and interesting building. (See Pavia, University of.) The Palazzo Malaspina contains a museum with a collection of paintings and an-

squares and is associated with the lives of Boethius and Petrarch. The other chief objects of interest are two theatres, an old castle built by the Visconti and now converted into a barrack, a huge bronze statue of Pope Pius V., a marble statue of Italia, and monuments to Garibaldi and to Volta. The Collegio Borromeo was founded in 1563 and the Collegio Ghislieri in 1569. Both offer scholarships. There are also an episcopal seminary, a lyceum, a technical school, an art and industrial school, and a Deaf and Dumb Institute. Pavia has manufactures of machines, hats, organs, chemicals, and leather. There are also important marble works. The yearly fair is largely attended, and the chief trade is in wine, rice, oil, silk, and cheese. Population (commune), in 1881, 34,826; in 1901, 35,447.

Pavia, the ancient *Ticinum*, was founded by the Ligurii. It became a place of considerable importance after the fall of the Roman Empire. It came into the possession of the Goths and Lombards, and the latter made it the capital of their Italian Kingdom, which was conquered by Charles the Great in 774. In 924 the city was taken and destroyed by the Hungarians. It became independent in the twelfth century. After having been weakened by civil wars, it was conquered by the Visconti of Milan in 1359. From this time its history is merged in that of the Duchy of Milan and of Lombardy. Here, on February 24, 1525, the forces of Charles V. defeated the French and captured Francis I. The city was stormed and pillaged by Napoleon in 1796.

PAVÍA. A town of Panay, Philippines, in the Province of Iloilo, situated six miles northwest of Iloilo. Population, 10,220.

PAVIA, UNIVERSITY OF. One of the oldest universities of Europe. It had its inception in a law school that flourished before the twelfth century, and even in the first half of the fourteenth century there still existed traces of the older institution. Galeazzo II. Visconti obtained from Charles IV. a charter for a Studium Generale in 1361, which conferred upon it all university privileges, and in 1389 it received the same privileges from Pope Boniface IX. In 1398 it was removed to Piacenza. With the death of Galeazzo it declined and by 1404 it ceased to exist. In 1412 it was restored by Filippo Maria Visconti, and it soon vied with the leading Italian universities, particularly in Roman law. It had a large attendance of foreigners. In the sixteenth and seventeenth centuries its fame declined, but after its reorganization in 1770 by Maria Theresa and in 1817 by Emperor Francis I. it again assumed considerable importance among European universities. In 1902 it consisted of the faculties of law, medicine, and surgery, mathematics and natural science and philosophy, and the School of Pharmacy. The attendance was over 1300. The Collegio Ghislieri, founded in 1569, prepares students for the university. The library contains 160,000 volumes, 100,000 pamphlets, and 1100 manuscripts.

PAVIE, pä'vē'. THÉODORE-MARIE (1811-96). A French Orientalist. He was born at Angers. Early travels in the United States, Central America, and Canada resulted in the publication of his *Voyage aux États-Unis et au Canada* (2 vols., 1828-33); and subsequent travels through Asia, and the study of Asiatic languages, especially Sanskrit and Chinese, formed the foundation of valuable historical and literary contributions to the *Revue des Deux Mondes*, the *Journal Asiatique*, and the *Bulletin* of the French Geographical Society. They also led to appointments as professor of Sanskrit literature in the Collège de France from 1853 to 1857, and as professor of Oriental literature in the university of his native town, where he died May 12, 1896. His principal work is the *San-kouĕt-chi* (2 vols., 1845-51), a history of China in the thirteenth century; other works are: *Fragments du Mahābhāratæ* (1844); *Les trois religions de la Chine* (1845); *Bhodjaprabandha* (1855), a History of Bhoja, King of Malwa; and numerous books of travel.

PAVILION (OF. *pavillion*, *paveillon*, Fr. *pavillon*, tent, from Lat. *papilio*, butterfly, tent, pavilion). A portion of a building, under a separate roof, originally of a tent-like form, with the slope of the roof either straight or curved. The term is used generally to describe a wing or dependency of a large structure, usually of lighter construction or greater height. This form is much used in France. The higher parts of the new buildings at the Louvre are good examples of pavilions.

PAVING. See PAVEMENT.

PAVLOGRAD, päv'lō-gräd'. A town in the Government of Ekaterinoslav, Russia, situated on a tributary of the Samara, 50 miles east of Ekaterinoslav (Map: Russia, E 5). It has a gymnasium and carries on a large trade in flour and grain. The town was founded in 1779, and is settled by Zaporogian Cossacks. Population, in 1897, 17,188.

PAVLOVO, päv'lō-vō. An industrial town in the Government of Nizhni-Novgorod, Russia, situated on the Oka, 40 miles southwest of Nizhni-Novgorod. It has steel works and match factories. There are a museum of cutlery and models, and a library. Population, in 1897, 12,200.

PAWNBROKING (from *pawn*, OHG. *pfant*, Ger. *Pfand*, pledge, from OF. *pan*, pawn, pledge; usually considered identical with OF., Fr. *pan*, piece of a garment; more probably from OF. *paner*, Sp. *apandar*, to plunder, *apañar*, to take away + *broking*: connected with AS. *brūcan*, OHG. *brūhhen*, Ger. *brauchen*, to use, need, Lat. *frui*, to use, enjoy). The business of lending money on the security of personal effects left in the possession of the lender. Pawning has existed in some form in all ages and among all peoples. It is much older than banking, with which it was originally connected. The Chinese, Greeks, and Hebrews borrowed on pledges. In mediæval times pawnbroking was synonymous with usury. In Europe the business was carried on at first by Jews and later by Lombards. Pawnbroking is a legitimate business, but since the expense of administering small loans is very great, the pawnbroker has often been allowed to charge as high as 100 per cent. where the regular rate of interest is only 6 per cent. Recognizing the great disadvantage under which the poor borrower labors, efforts have been made to carry on the business in the interest of the borrowers. This effort has taken the form of monts de piété on the Continent. France is especially successful in maintaining these institutions. They are associated with the town councils, hospitals, and charity bureaus. When endowed they charge no

interest, and the highest interest is 12 per cent. The Paris institution acts as the poor man's safe deposit, as it has excellent facilities for storage and makes a practice of disinfecting goods. The objections to its methods are: (1) the amount of time the system takes; and (2) the undervaluation of goods. Belgium follows French methods. The pawnbroking business has been controlled since 1618. The monts de piété are managed by councils and charity administrators, while their funds are borrowed from the charity department.

Germany has royal, municipal, and private pawn shops. The private pawn shops are regulated and any city may prohibit them. The municipal pawn shops are usually in connection with the savings-bank and are self-supporting. In Austria-Hungary the private pawn shops are in the majority. The Imperial Pawn Shop of Vienna, founded in 1707 by Joseph I., is now self-supporting, but, because of the origin of its capital, one-half of its profits go to the poor. The remainder is used in extending the business. In Spain the mont de piété is connected with the savings-bank. Denmark regulates its pawn shops. Sweden has had successful private companies since 1880. Few pawn shops are found in Switzerland, only one in Berne. Saint Petersburg and Moscow are the only cities of Russia maintaining municipal pawn shops.

The charter of the Bank of England gives that institution power to lend on plate and non-perishable commodities at 5 per cent. In 1695 the directors seriously considered establishing pawn shops. Pawnbroking was first regulated by James I., then under George III. The law of 1872 is very favorable to pawnbrokers, but since 1894 there has been an increased interest in plans for improving the position of those who borrow money on pledges. General Booth proposed a scheme, but the funds were not at hand to develop it.

In the United States the business has until recently been entirely in the hands of private pawnbrokers, who do business under State regulations or municipal ordinances. The State regulations may provide for a license, a bond, regulation of interest charges, methods of sale, and the disposition of the surplus. The city ordinances usually place the pawn shops under police control, providing for daily inspection or daily reports. The laws are generally inadequate. Only a few States forbid a charge above the legal rate of interest. Where a sale of goods requires an advertisement and by auction, the law is frequently evaded or not enforced. It is very seldom, if ever, that the borrower receives any surplus from the sale of his goods. The difficulties in regulation arise from the character of the business and the lack of ordinances. Since pawnbroking can exist only in large centres of population, the problem of regulation has been one of local rather than general interest. The ignorance or pride of the borrowers prevents them from making necessary complaints to the authorities. Low licenses invite a motley crowd of pawnbrokers. Where the regulations permit only four or five pawn shops to exist, as in Providence, Washington, or Baltimore, they are respectable, but the large number of shops in Boston and Philadelphia cannot be easily controlled. Some of the maximum charges are: Baltimore, 30 per cent.; Boston, 132 per cent.; Buffalo and Chicago, 120 per cent.; Cleveland, 300 per cent.; Pittsburg, 240 per cent.; and Providence, 180 per cent. The smallest pawns do not pay pawnbrokers even at 100 per cent. Municipal pawn shops were proposed for Philadelphia in 1816 by Dr. Mease. The oldest philanthropic concern in the United States is the Pawners' Bank of Boston, started in 1859, which underwent many losses and discouragements. It is now the Collateral Loan Company, and pays a regular dividend. In 1894 Dr. Greer of Saint Bartholomew's Protestant Episcopal Church in New York City started a pawnbroker's shop in his parish. Out of this developed the Provident Loan Company, which opened its doors May 21, 1894, at 279 Fourth Avenue. The company is incorporated, with a board of fifteen directors, and has a subscribed capital of $100,000. Only jewelry and articles of considerable value, but small in bulk, are received. Bedding and furniture are barred because of lack of room. As a result the people reached are independent workers, who need money to tide over a period of sickness or lack of work. One per cent. a month, or one-third the legal rate, is charged. In competition with the Provident Loan Society, pawnbrokers have reduced their charges, sometimes even lower, or they have advertised that they will lend at the same rate as the Provident Loan Society. The report for 1902 states that $3,866,325 was lent on 130,158 pledges; the average amount of each loan was $29.70; and the average amount lent per day was $12,942.70. The average loan of the pawn shops is much lower, sometimes being as low as $1.41 in one month. More than 99 per cent. of the pledges were redeemed. This enterprise pays 6 per cent. on the capital.

After opposition from the pawnbrokers, who were well organized, Illinois passed a compromise measure, authorizing lending societies, but only permitting loans on personal property and limiting the capital to $50,000. The State Pawners' Society opened its office in Chicago November 1, 1898. The society has a board of directors elected by the stockholders, with two additional members selected respectively by the Governor and the Mayor. The maximum interest charged is one per cent. per month, with an additional charge of one-half per cent. for storage and insurance. The pressure for loans has been heavy. The society pays 6 per cent. dividends. At the time the office opened there were 67 pawn shops in Chicago. The Chattel Loan Association of Baltimore, established May 12, 1898, expects ultimately to do a pawnbroking business. The Worcester Collateral Loan Association, the Workingmen's Loan Associations of Boston and Providence, the Provident Loan Company of Buffalo, and the Hebrew Free Loan Association of New York deal with chattel mortgages and indorsed loans.

BIBLIOGRAPHY. *United States Bulletin of Department of Labor*, No. 21 (1899). For Great Britain, *Report of Her Majesty's Representatives Abroad on Systems of Pawnbroking in Various Countries* (1894). See MONTS DE PIÉTÉ.

PAWNEE, pą-nē'. The most important tribe of the Caddoan stock (q.v.) of North American Indians. They formerly claimed a large territory upon the Platte River, in what is now Nebraska, ranging from the Niobrara on the north to the Arkansas on the south, and occasionally extending their forays far down into Texas or New Mexico. They were in chronic

warfare with every surrounding tribe with the exception of the Omaha, Ponca, and Oto, whom they treated as wards and dependents. The few remaining are now associated with the Ponca, Oto, and Tonkawa upon Oakland Reservation, Oklahoma.

The Pawnees call themselves *Skihiksihiks*, 'men of men,' or 'super-excellent men.' The popular name appears to be derived from the Pawnee *pariki*, 'a horn,' referring to their peculiar scalplock, which was dressed to stand nearly erect. This mark indicates a Pawnee in the pictographs of the plains tribes and undoubtedly also gave origin to the tribal sign, now interpreted to mean 'Wolf People.' They have four bands or grand divisions, viz, *Shau-i*, or Grand (i.e. 'principal'), *Kitkehaki*, or Republican, *Pitahauerat*, or Tapage ('noisy'), and *Skidi*, or Loup ('Wolf'). The Skidi were originally a distinct and hostile tribe, which had preceded the Pawnee proper, by whom they were conquered and incorporated. Traditional and historic evidence shows that the Pawnee and Arikara migrated from the south, probably from about the middle Red River, adjoining the cognate Caddo tribes. The Skidi and Arikara may have preceded the others by perhaps a century, the latter continuing up the Missouri, while the Skidi halted at the Platte, where they were overtaken by the Pawnee proper. The dialects of the Pawnee, Skidi, Arikara, and Wichita are all so closely related as to constitute but one language. The Pawnee appear to have been known to the Spaniards as early as 1626. They are noted upon Marquette's map of 1673 about where they were found in 1804 by Lewis and Clark, viz, the lower Platte near its confluence with the Missouri. By treaty in 1833 they ceded their lands south of the Platte and came under the supervision of an agent. Some civilizing work was started among them, which prospered for a little time until the hostile Sioux drove them south of the river, compelling them to abandon their fields and villages. About the same time, in 1838, the great smallpox epidemic carried off at least 2000 of their number. In 1849 probably a greater number perished by cholera. Since then their history has been one of swift and certain decline from disease, removal, and unceasing warfare in which the Pawnee found every man's hand against him. They have never, however, as a tribe been at war with the whites, but, on the contrary, have frequently furnished a contingent of scouts in our various difficulties with the Northern plains tribes. One main factor in the introduction of disease has been the great overland trail, which passed directly through their territory. In 1858 they ceded all their remaining original territory except a strip 30 miles long by 15 wide upon the Loup River. In 1874 they sold this and removed to their present location in Oklahoma.

Like all the tribes of Caddoan stock, the Pawnee were principally agricultural and sedentary, building large circular houses of logs covered with earth, and raising abundant crops of corn, pumpkins, and other Indian vegetables, which they dried or cached for winter use. The skin tipi was used only for temporary purposes when upon the buffalo hunt, away from their permanent villages. They are of good physique, somewhat more robust than the regular hunting tribes, and were noted for their running and walking powers. It is said that their warriors could cover one hundred miles in twenty-four hours on a foot trot without stopping to eat or sleep. They were devoted to religious ceremonials, the Skidi being particularly noted for their bloody rite of human sacrifice, offered to the Morning Star, as the spirit of fertility on the occasion of the annual corn planting, the victim being a captive girl. See PETALESHARO.

The best early estimate of their population is that by the missionaries Dunbar and Allis in 1835, who give them 10,000. In 1840, after the smallpox, the same authorities estimated them at about 7500. In 1847 they were about 8400, but were again terribly reduced by the great cholera epidemic in 1849. Later official estimates are 4686 in 1856; 3416 in 1861; 2376 in 1874 (just before removal to Oklahoma); 1440 in 1879; 824 in 1889; 629 in 1901.

PAWNEE CITY. The county-seat of Pawnee County, Neb., 75 miles south-southeast of Lincoln, on the Chicago, Rock Island and Pacific and the Burlington and Missouri River railroads (Map: Nebraska, II 3). It is chiefly important as the commercial centre of a productive section engaged in farming and stock-raising. Population, in 1890, 1550; in 1900, 1969.

PAWTUCK'ET. An important manufacturing city in Providence County, R. I., 4 miles north of Providence, on both sides of the Pawtucket River, at the head of navigation, and on the New York, New Haven and Hartford Railroad (Map: Rhode Island, C 2). Pawtucket covers an area of nearly nine square miles. It has Daggett Park, Collyer Monument, and a Soldiers' Memorial Monument, several interesting bridges of various types, Sayles Memorial Library, Home for Aged Poor, Emergency Hospital, and a State armory. Among the more prominent business structures are the Safe Deposit Building, Industrial Trust Building, Providence County Savings Bank, Taylor Building, and Kinyon Block. Other points of interest are Ten-Mile River and Pawtucket Falls, 50 feet in height, noteworthy alike for beauty of scenery and as the source of great water power.

Pawtucket is well known for the extent and variety of its manufactures, which include cotton, silk, and woolen goods, plush, velvet braid, webbing, various kinds of machinery, foundry products, gymnasium supplies, electrical supplies, thread, hair-cloth, yarns, and wire. There are also numerous dyeing, bleaching, and finishing establishments. The government is vested in a mayor annually elected, a bicameral council, and in administrative officials, the majority of whom are elected by the council. The school committee is independently chosen by popular vote. Pawtucket spends annually in maintenance and operation over $700,000, the municipal budget balancing at nearly $1,325,000. The principal items of expense are $135,000 for the operation of the water-works, $135,000 for schools, $50,000 for the police department, $40,000 for the fire department, and $38,000 for municipal lighting. The water-works, which were built in 1878 by the city at a cost of over $1,840,000, are owned and operated by the municipality. Population, in 1890, 27,633; in 1900, 39,231.

The portion of the city of Pawtucket on the

west side of the river was originally the principal village in the town of North Providence, which was incorporated in 1765. This town was divided in 1874, and the village of Pawtucket was consolidated with the town of Pawtucket on the east side of the river as the town of Pawtucket, which in 1886 was incorporated as a city. The portion of Pawtucket on the east of the river was originally in Massachusetts, and was incorporated as the town of Pawtucket in 1828, having been set off from the parent town of Seekonk. In 1862 the town of Pawtucket, Mass., was ceded to Rhode Island, and remained a separate town until its consolidation with the village of Pawtucket in North Providence in 1874. The first cotton factory in the United States was established here in 1790 by Samuel Slater. This mill is still standing. Consult Greene, *The Providence Plantations* (Providence, 1886).

PAX (Lat., peace), called also PACIFICALE and OSCULATORIUM. The 'kiss of peace,' and also a sacred utensil, employed in some of the solemn services of the Catholic Church in the ceremony of giving the so-called 'kiss of peace' during the mass. The practice of saluting each other—the men, men, and the women, women—during public worship, and particularly in the *agape*, or love-feast, is frequently alluded to by ancient writers, as Cyril of Jerusalem, and Augustine. All the ancient liturgies, without exception, refer to it as among the rites with which the eucharist was celebrated; but they differ as to the time and the place in the eucharistic service in which it is introduced. The ceremony commences with the celebrating bishop or priest, who, after kissing the altar, salutes the deacon, not (in modern times) by an actual kiss, but by placing the hands upon his shoulders and slightly inclining the head toward him. By the deacon the salute is tendered to the other clergy assisting. Originally, the laity also were included, but this has long since been abandoned. It is when the mass is celebrated by a high dignitary that the utensil called the pax is used. The pax is sometimes a crucifix, sometimes a reliquary, sometimes a tablet with a figure sculptured or enameled upon it. Having been kissed by the celebrant, and by him handed to the deacon, it is carried by the latter to the rest of the clergy. The pax is omitted in the mass of Maundy Thursday (q.v.), to express horror of the treacherous kiss of Judas.

PAXOS, pāk'sŏs, or **PAXO**. One of the Ionian Islands (q.v.). It lies nine miles south of Corfu, and about the same distance from Acarnania, Greece (Map: Greece, B 2). It is about five miles long and two miles broad, and is mainly a hilly mass of limestone with an absence of potable water. It is noted for its fruit and the fine quality of its olive oil. Goats and mules are raised. Population, in 1896, 3814.

PAX'TON. A city and the county-seat of Ford County, Ill., 103 miles south-southwest of Chicago, at the junction of the Lake Erie and Western and the Illinois Central railroads (Map: Illinois, D 3). It is the seat of the Rice Collegiate Institute. Among its industrial establishments are hardware manufactories, machine shops, flour mills, carriage works, brick and tile plants, etc. The water-works are owned by the municipality. Population, in 1890, 2187; in 1900, 3036.

PAXTON, JOHN RANDOLPH (1843—). A Presbyterian clergyman. He was born at Canonsburg, Pa., graduated from Jefferson College in 1866 and from the Western Theological Seminary, Allegheny, in 1869. He served in the 140th Pennsylvania Regiment from 1862 until the end of the war, rising to the rank of second lieutenant. His first pastorate was at Churchville, Md., from which he proceeded to the Pine Street Church, Harrisburg, Pa., then to the New York Avenue Church, Washington, D. C., and in 1882 he became pastor of the West Presbyterian Church, New York City. In 1893 he resigned his charge because of ill health, but resumed preaching at the New York Presbyterian Church in 1898.

PAXTON, Sir JOSEPH (1801-65). An English architect and horticulturist, born at Milton-Bryant, near Woburn, Bedfordshire. As superintendent of the gardens of Chatsworth, in the employ of the Duke of Devonshire, he designed the large conservatory of Chatsworth (1836-40). This experience led him to propose a crystal palace of glass and iron for the great London Exhibition of 1851. It was the first time these materials had been employed on so extensive a scale. His design obtained for him great popularity and the honor of knighthood. The Crystal Palace of 1851 was removed from Hyde Park, but became the germ of the nobler and more splendid palace at Sydenham, the construction of which he superintended; the grounds were also laid out by him.

PAXWAX. See FAXWAX; LIGAMENT.

PAY AND ALLOWANCES. A military term used to denote the rate of pay and allowances granted to officers and enlisted men of the military and naval services of the United States.

ALLOWANCES to officers and enlisted men are made on a basis of requirement and rank; and may be either in kind, or in lieu of the amount to which such officer or soldier by regulation is entitled. The money allowance of clothing is allotted half-yearly for the first year, estimates for clothing being made quarterly as follows: On January 1st, for a supply to last until June 30th; on April 1st, until September 30th; on July 1st, until December 31st; on October 1st, until March 31st. Commanding officers settle the clothing accounts of their men six months after enlistment and afterwards on June 30th and December 31st of each year. (For allowances of forage, see FORAGE.) Soldiers receiving allowance or commutation in lieu of food (ration) are paid according to a scale, which varies in amount from 25 cents per diem, allowed enlisted men on conclusion of furlough; 40 cents per diem to sergeants of post non-commissioned staff, on duty at stations where there are no other troops; 75 cents per diem to a soldier on detached duty, to $1.50 per diem to a soldier traveling under orders from a station, where his rations have been regularly commuted —which is the maximum allowance in lieu of rations for enlisted men. The allowance of baggage permitted officers and men will be found under BAGGAGE.

Whenever there are sufficient quarters in a barracks or station, permanent quarters are assigned to the field and staff officers of the garri-

son. Regimental officers are provided with quarters according to convenience of location and the rank of the recipient. Bachelor quarters are assigned to officers without families. On the arrival of a command at a new station the original assignment of quarters is made by a board of officers consisting of the commanding officer, the two senior line officers present, the senior surgeon, and the quartermaster. Allowances in lieu of quarters are according to rank and circumstances.

Retired officers detailed for duty at colleges are entitled to full pay, but not commutation of quarters. The maximum pay of a colonel is established by law at $4500 per annum, and that of a lieutenant-colonel at $4000. An aide-de-camp to a major-general is allowed $200 per year in addition to the pay of his rank; an aide-de-camp to a brigadier-general is allowed $150 per year additional; and an acting commissary

TABLE OF PAY OF COMMISSIONED OFFICERS UNITED STATES ARMY

GRADE	Pay of officers in active service					
	Pay of grade		Monthly pay			
	Yearly	Monthly	After 5 years service	After 10 years service	After 15 years service	After 20 years service
			10 per cent.	20 per cent.	30 per cent.	40 per cent.
Lieutenant-General	$11,000	$916.67	.....	.....	.....	.....
Major-General	7,500	625.00	.....	.....	.....	.....
Brigadier-General	5,500	458.33	.....	.....	.....	.....
Colonel	3,500	291.67	$320.83	$350.00	$375.00	$375.00
Lieutenant-Colonel	3,000	250.00	275.00	300.00	325.00	333.33
Major	2,500	208.33	229.17	250.00	270.83	291.67
Captain, mounted	2,000	166.67	183.33	200.00	216.67	233.33
Captain, not mounted	1,800	150.00	165.00	180.00	195.00	210.00
Regimental Adjutant—Captain, mounted	2,000	166.67	183.33	200.00	216.67	233.33
Regimental Quartermaster—Captain, m'ted	2,000	166.67	183.33	200.00	216.67	233.38
Battalion and Squadron Adjutant	1,800	150.00	165.00	180.00	195.00	210.00
Regimental Commissary	1,800	150.00	165.00	180.00	195.00	210.00
First Lieutenant, mounted	1,600	133.33	146.67	160.00	173.33	186.67
First Lieutenant, not mounted	1,500	125.00	137.50	150.00	162.50	175.00
Second Lieutenant, mounted	1,500	125.00	137.50	150.00	162.50	175.00
Second Lieutenant, not mounted	1,400	116.67	128.33	140.00	151.67	163.33
Chaplain	1,500	125.00	137.50	150.00	162.50	175.00

GRADE	Pay of retired officers					
	Pay of grade		Monthly pay			
	Yearly	Monthly	After 5 years service	After 10 years service	After 15 years service	After 20 years service
Lieutenant-General	$8,250	$672.50	.....	.....	.....	.....
Major-General	5,625	468.75	.....	.....	.....	.....
Brigadier-General	4,125	343.75	.....	.....	.....	.....
Colonel	2,625	218.75	$240.62	$262.50	$281.25	$281.25
Lieutenant-Colonel	2,250	187.50	206.25	225.00	243.75	250.00
Major	1,875	156.25	171.87	187.50	203.12	218.75
Captain, mounted	1,500	125.00	137.50	150.00	162.50	175.00
Captain, not mounted	1,350	112.50	123.75	135.00	146.25	157.50
Regimental Adjutant—Captain, mounted	.....	.....	.....	.....	.....	.....
Regimental Quartermaster—Captain, m'ted	.....	.....	.....	.....	.....	.....
Battalion and Squadron Adjutant	.....	.....	.....	.....	.....	.....
Regimental Commissary	.....	.....	.....	.....	.....	.....
First Lieutenant, mounted	1,200	100.00	110.00	120.00	130.00	140.00
First Lieutenant, not mounted	1,125	93.75	103.12	112.50	121.87	131.25
Second Lieutenant, mounted	1,125	93.75	103.12	112.50	121.87	131.25
Second Lieutenant, not mounted	1,050	87.50	96.25	105.00	113.75	122.50
Chaplain	1,350	112.50	123.75	135.00	146.25	157.50

For allowances of food and ration, see RATION. The use of public horses by officers receiving mounted pay is regulated by department commanders, according to local exigencies. A captain or lieutenant of artillery is allowed the use of a battery horse if serving with a light or mounted battery. The sum of $100 is allowed for the transport of each horse entitled to forage, and an attendant to accompany them. If such sum does not cover the actual cost, the excess must be prepaid by the owner, who is also required to pay all the expenses of the attendant other than his transportation. Commutation of quarters of commissioned officers is at the rate of $12 per month per room. When traveling an officer is allowed mileage at certain fixed rates, and actual expenses only for sea travel to, from, or between Cuba, Hawaii, and the Philippines by the shortest regularly traveled routes.

Retired officers detailed for duty at colleges are entitled to full pay, but not commutation of quarters. The maximum pay of a colonel is established by law at $4500 per annum, and that of a lieutenant-colonel at $4000. An aide-de-camp to a major-general is allowed $200 per year in addition to the pay of his rank; an aide-de-camp to a brigadier-general is allowed $150 per year additional; and an acting commissary of subsistence $100 per year additional. Assistant surgeons are entitled to pay of captain after five years' service; and an acting judge advocate, detailed by the Secretary of War, to the pay and allowances of a captain of cavalry. Retired officers receive 75 per cent. of pay (salary and increase) of their rank, a retired chaplain receiving 75 per cent. of the pay (salary and increase) of his rank (captain, not mounted).

After five years' service the soldier's pay is increased by two dollars per month, and after ten years an additional dollar per month is granted for every five years of his service up to thirty years.

In the British army, where the rates of pay are lower than in the United States, service in India is made more attractive by the numerous

TABLE OF MONTHLY PAY OF ENLISTED MEN OF THE UNITED STATES ARMY.

RANK AND SERVICE	First two years	Third year	Fourth year	Fifth year and re-enlisted pay
REGIMENT, CORPS, BATTALION				
Battalion Sergeant-Major—Engineers Battalion Quartermaster-Sergeant—Engineers Sergeant-Major—Cavalry, Infantry	$26	$37	$38	$39
Quartermaster-Sergeant—Cavalry, Infantry Commissary-Sergeant—Cavalry, Infantry Senior Sergeant-Major—Artillery Squadron Sergeant-Major—Cavalry	34	35	36	37
Battalion Sergeant-Major—Infantry Color Sergeant—Cavalry, Infantry Junior Sergeant-Major—Artillery	25	26	27	28
COMPANY, TROOP, BATTERY				
Sergeant, first-class—Signal Corps	45	46	47	48
Sergeant—Engineers, Ordnance, Signal Corps Quartermaster-Sergeant—Engineers First Sergeant—Engineers	34	35	36	37
First Sergeant—Artillery, Cavalry, Infantry	25	26	27	28
Corporal—Engineers, Ordnance, Signal Corps	20	21	22	23
Cook—Engineers, Signal Corps Sergeant—Artillery, Cavalry, Infantry Quartermaster-Sergeant—Artillery, Cavalry, Infantry				
Cook—Artillery, Cavalry, Infantry Mechanic—Coast Artillery Stable Sergeant—Field Artillery	18	19	20	21
Private, first-class—Engineers, Ordnance, Signal Corps	17	18	19	20
Artificer—Field Artillery, Infantry Farrier, blacksmith, saddler—Cavalry	15	16	17	18
Corporal—Artillery, Cavalry, Infantry Wagoner—Cavalry	14	15	16	17
Trumpeter—Cavalry Musician—Artillery, Infantry, Engineers Private—Artillery, Cavalry, Infantry, Signal Corps Private, second-class—Engineers, Ordnance	13	14	15	16
BAND—ARTILLERY, CAVALRY, INFANTRY, ENGINEERS				
Chief musician	60	61	62	63
Drum Major	25	26	27	28
Chief trumpeter—Artillery, Cavalry Principal musician	22	23	24	25
Sergeant Cook	18	19	20	21
Corporal	15	16	17	18
Private	13	14	15	16

opportunities it offers for extra pay, originally commonly described as "Batta." Allowances, also, are paid at a higher rate than at home.

Half Pay is practically any form of reduced pay, and the term is still frequently used to describe the rate of pay of a retired or disabled officer.

PAYER, pī'ẽr, JULIUS VON (1842—). An Austrian Polar explorer and painter. He was born at Schönau, near Teplitz, Bohemia, was educated in the military academy at Wiener-Neustadt, and entered the army in 1859. Subsequently attached to the general staff, he was intrusted with the survey of some of the most inaccessible regions in the Alps. In 1869-70 he took part in the second German expedition to the North Pole, and contributed much to the knowledge of the eastern coast of Greenland. In 1872 he was appointed with Weyprecht to lead the Austrian expedition to the North Pole, which resulted in the discovery (1873) and exploration (1874) of Franz Josef Land, and which was described by him in *Die oesterreichisch-ungarische Nordpolexpedition in den Jahren 1872-74* (1876). Upon his return he retired from the military service to devote himself entirely to painting, studied for two years in Frankfort under Hasselhorst, three years in Munich under Wagner, and four years in Paris. From the first he worked on large canvases, painting stirring episodes from his Arctic experience. In 1883 he was awarded the great gold medal in Munich for "The Bay of Death," the best of four pictures illustrating the Franklin expedition. In 1884 he lost the sight of one eye, and this delayed the completion of the other pictures in the series, of which "Leaving the Ships" was exhibited in 1886, and "The Death of Franklin" in 1889. For the Museum of Natural History in Vienna he executed mural paintings of "Views in Franz Josef Land," and "Never Retreat" (1892). He won gold medals also in Berlin (1886) and Paris (1889).

PAYMASTER. An officer in the military or naval service charged with the payment of troops and other duties involving the receipt and disbursement of public funds. The pay department of the United States Army is under a paymaster-general, with the rank of brigadier-general, who under the direction of the Secretary of War has charge of the payment of the army. There are two assistant paymasters-general with the rank of colonel; three deputy paymasters-general, with the rank of lieutenant-colonel; and twenty paymasters, with the rank of major. The chief paymaster of a department, under the direction of its commander, has control of all paymasters in the command, and is responsible for them so far as the payment of troops is concerned.

In the United States Navy a paymaster has charge of the public funds carried on board ship (or at a navy yard or shore station), also of the clothing and provisions for the enlisted men. Under directions of his commanding officer, he makes such purchases as may be necessary from

time to time. At shore stations paymasters are also keepers of the 'general store,' from which all departments of the station draw supplies. In May, 1902, the number of officers of the different ranks of the pay corps was 136. They receive the same pay as the officers of the line with whom they rank.

PAYMASTER-GENERAL. An officer of the British Ministry, but not of the Cabinet, charged with superintending the issue of all moneys voted by Parliament. He has no control over the sums issued, paying merely on the order of the department concerned. He is always either a peer or a member of the House of Commons, and changes with the Ministry. The paymaster-general is assisted by a deputy and a staff of clerks, the annual cost of the whole department amounting to about £25,000.

PAYMENT. In law, the satisfaction or discharge of a legal obligation by the delivery of money, or something which the creditor accepts in lieu of money. Payment is, therefore, employed in a more limited sense than performance, which implies the fulfillment of any legal obligation, as carrying out the provisions of an agreement or contract to do work or furnish materials to another. In order to be effectual, payment must be made to the proper party, that is, either to the one to whom it is due, personally, or to some other person lawfully authorized by him to receive it, and it must be of the exact amount due. It should be made at the exact time and place agreed upon, or implied by law, in order to avoid a claim for interest from that time, or the commencement of an action. In general where no place for payment has been previously agreed upon by the parties, the debtor must seek the creditor, or he may be considered as in default. The chief consequences which may ensue on a default of payment are, in general, to give the creditor the right to have immediate recourse to any security, as to sell an article pledged as security, or to foreclose a mortgage or other lien, and if the contract is a continuing one and payments become due in installments to rescind the contract, refuse to proceed further, and sue the debtor for the amount then due and unpaid. Where payment is made to one of several joint creditors, the debtor is discharged, even though the one to whom he paid it does not account to his fellow creditors. The effect of a valid payment is to discharge the debtor from his obligation. See CREDITOR; DEBTOR; LEGAL TENDER; NEGOTIABLE PAPER. Consult the authorities referred to under CONTRACT.

PAYN, JAMES (1830-98). An English novelist. He was born in Cheltenham; graduated at Cambridge in 1852, and adopted literature as a profession. He contributed largely to periodicals; became coeditor with L. Ritchie of *Chambers's Journal* in 1858, and in the following year was made sole editor, which position he held until 1874. From 1883 to 1896 he was the successor of Leslie Stephen as editor of the *Cornhill Magazine*. The novel *Lost Sir Massingberd* (1864) was the first of his works to attract attention, and after its appearance he published more than one hundred novels, among which are *Cecil's Tryst* (1872); *Fallen Fortunes* (1876); *By Proxy* (1878); *A Grape from a Thorn* (1881); *The Heir of the Ages* (1886); *The Eavesdropper* (1888); *Gleams of Memory* (1894); and *In Market Overt* (1895), *Another Burden* (1897), and a collection of essays, *The Backwater of Life* (1899), published posthumously with an introduction by Leslie Stephen.

PAYNE, HENRY B. (1810-96). An American politician and capitalist, born at Hamilton, N. Y. He graduated at Hamilton College in 1832, and two years later began to practice law at Cleveland, Ohio. In 1849 he was elected to the State Senate by the Democrats, and was their candidate for United States Senator in 1851 and for Governor in 1857. At the Charleston convention in 1860 he exerted his influence to check the secession movement and during the Civil War remained a strong Union man. In 1872 he led the Ohio delegation at the Baltimore convention which nominated Horace Greeley for the Presidency. Two years later he was elected to Congress by a fusion of Democrats and Liberal Republicans, and was one of the representatives of the House on the Electoral Commission in 1877. He was elected United States Senator in 1884 and served from 1885 until 1891. He was for many years interested in various industrial, railroad, and mining projects, and accumulated a large fortune.

PAYNE, HENRY CLAY (1843—). An American politician and Cabinet officer. He was born in Ashfield, Mass., was educated at Shelburne Falls Academy, and in 1859 began a business career in Northampton. In 1863 he removed to Milwaukee, Wis., where he successfully engaged in mercantile business. From 1875 to 1885 he was postmaster of Milwaukee. Subsequently he became largely interested in electric railway and lighting companies, effected a consolidation of various competing companies, and became president of the combined corporation. From 1887 he was for several years president of the Milwaukee and Northern Railroad, and in 1893 was appointed one of the receivers for the Northern Pacific Railroad. Meanwhile he was remarkably successful as a political manager; served for many years as chairman of the Republican State Central Committee in Wisconsin; in 1880 became a member of the Republican National Committee, and of its executive committee, and in the Presidential campaigns of 1896 and 1900, as vice-chairman, conducted the Republican campaign in the West. In 1897 he was offered the post of Ambassador to Germany by President McKinley, but declined. In January, 1902, he succeeded Charles Emory Smith as Postmaster-General in President Roosevelt's Cabinet.

PAYNE, JOHN (1842—). An English poet and translator, born August 23, 1842. He was a solicitor by profession, and lived a retired life. He was one of a cluster of Neo-Romantic poets inspired by Rossetti, Morris, and Swinburne. Others of the group are Théophile Marzials (q.v.) and Arthur O'Shaughnessy (q.v.). Payne's verse comprises: *A Masque of Shadows* (1871); *Intaglios*, a sonnet sequence (1871); *Songs of Life and Death* (1872); *Lautrec*, a vigorous narrative poem (1878); and *New Poems* (1880). For the Villon Society he translated Villon's *Poems* (1878); the *Arabian Nights* (9 vols., 1882-84); *Tales from the Arabic* (1885); *Aladdin and the Enchanted Lamp* (1885); Boccaccio's *Decameron*; *Quatrains of Omar Khayyam* (1898); and *Poems of Shemseddin Mohammed Hafiz of Shiraz* (3 vols., 1901).

PAYNE, JOHN HOWARD (1791-1852). An American actor and playwright; best known, however, as the author of *Home, Sweet Home*. Born in New York, he lived in childhood at East Hampton, L. I. Payne showed great precocity. At thirteen years of age, while a clerk in a mercantile house in New York, he secretly edited a weekly paper, *The Thespian Mirror*. He was a student of Union College, when the bankruptcy of his father interrupted his education, and he decided to go on the stage, as the best means of supporting the family. He made his début at the Park Theatre, New York, February 24, 1809, as Young Norval in *Douglas*. This enterprise proved an artistic and pecuniary success, and he subsequently appeared before large and enthusiastic audiences in Boston, Philadelphia, and Baltimore. In 1813 he sailed for England, and made his appearance in London at Drury Lane Theatre as Master Payne, 'the American Roscius,' in his original part of Young Norval. His performances were well received by the public. After this he supported himself in England as actor, manager, and playwright, but, owing to his lack of business ability, was often in financial embarrassments. In 1815 Payne published in London a selection of poems called *Lispings of the Muse*. His fugitive writings, besides verse, include many articles in criticism, one of the best known being an essay on "Our Neglected Poets," published in the *Democratic Review* in 1838.

Payne adapted many plays from the French and produced a number of original ones, among them *Brutus, or the Fall of Tarquin*, *Thérèse*, *Virginia*, and the comedy of *Charles II*. The song *Home, Sweet Home*, occurs in his opera of *Clari, or the Maid of Milan*, which was produced at the Covent Garden Theatre in May, 1823. The music was adapted by Henry R. Bishop from an old melody which Payne had heard in Italy. The publishers of this song are said to have cleared 2000 guineas by it within a year, and the opera was very successful; by all this, however, Payne himself profited but little. In 1826-27 he edited in London a periodical called the *Opera Glass*. In 1832 he returned to America. He was appointed American consul at Tunis, Africa, in 1842; was recalled in 1845; and reappointed in 1851. He died there April 9, 1852, and was buried in the Cemetery of Saint George at Tunis. In 1883 his remains were brought to Washington. Consult: Harrison, *John Howard Payne* (new ed., Philadelphia, 1885); Brainard, *John Howard Payne: A Biographical Sketch* (Washington, 1885).

PAYNE, JOSEPH (1808-76). An English educator, born at Bury Saint Edmunds. He was chiefly self-educated, and in 1830 founded a school that developed into the successful Denmark Hill Grammar School for boys. In 1845 he and his wife founded the Mansion House School at Leatherhead and stayed there up to their retirement to Bayswater, London, in 1863. Payne's educational ideas were founded upon those of Jacotot, and he wrote in condemnation of the Eton system. In 1872 he was made the first professor of education at the College of Preceptors. His works were edited by his son, Dr. J. F. Payne, and published in two volumes: *Lectures on the Science and Art of Education* (1883) and *Lectures on the History of Education, with a Visit to German Schools* (1892).

PAYNE, PETER (c.1380-1455). An English Lollard; born near Grantham in Lincolnshire. He studied at Oxford, where he learned Wicliffite doctrines, was principal of Saint Edmund Hall (1410-14), and in 1416 was excommunicated, having failed to appear for trial on the charge of heresy. He fled from England to Prague, where Queen Elizabeth protected him, and where he became a prominent member of the Taborite Party. As such, he appeared in many religious conferences and by his extreme views did much to block a union of quarreling sects. The story of the latter years of his life, which were passed in Bohemia, is full of confusing detail, and it is uncertain whether Payne submitted after the defeat of the Taborites. All of his writings dealt with the defense of Wiclif's teachings. Consult Baker, *A Forgotten Great Englishman* (London, 1894).

PAYNE, WILLIAM HAROLD (1836—). An American educator, born in Farmington, Ontario County, N. Y. In 1858 he was appointed principal of a school in Three Rivers, Mich., and he held the same position in other schools of that state, concluding with Adrian, where he remained ten years, and was then elected to the newly created chair of pedagogy in the University of Michigan (1879). He was chancellor of the University of Nashville, Tenn., and president of the Peabody Normal College from 1888 until 1901, when he returned to the University of Michigan. He wrote: *School Supervision* (1875); *Educational Doctrine* (1882); *Contributions to the Science of Education* (1887); and translated three of Compayré's works: *History of Pedagogy* (1886); *Lectures on Teaching* (1888); and *Elements of Psychology* (1890).

PAYNE, WILLIAM MORTON (1858—). A critic and educator, born in Newburyport, Mass. He was assistant librarian of the Chicago Public Library (1874-76), teacher in Chicago high schools after 1876, literary editor of the Chicago *Morning News* (1884-88), of the Chicago *Evening Journal* (1888-92), and afterwards associate editor of the *Dial*. He is known especially for his criticism of modern literature—English, French, German, Italian, and Scandinavian. His essays are in part gathered in *Our New Education* (1884), *Little Leaders* (1895), and *Various Views* (1902).

PAYNE SMITH, ROBERT (1819-95). An English theologian and Orientalist. He was born at Chipping Campden, Gloucestershire, and entered Pembroke College, Oxford, where he pursued Oriental studies, and took the Sanskrit scholarship in 1840 and a Hebrew scholarship in 1843. After his ordination he spent three years in pastoral work at Crendon, Long Wittenden, and Thame, then became classical master at the Edinburgh Academy and later preached also at Trinity Chapel. In 1853 he went to London as head master of the Kensington proprietary school, and pursued his favorite Oriental studies at the British Museum. In 1857 he became sub-librarian at the Bodleian Library, and here he began his great work, the *Thesaurus Syriacus*, the first part of which was published in 1868. From 1865 to 1870 he was regius professor of divinity at Oxford, and in 1869 he delivered the Bampton lectures, published as *Prophecy a Preparation for Christ* (1869). In 1870 he became Dean of Canterbury. His posi-

tion in the Church was one of sympathy with the evangelicals and his popularity extended widely, even in Non-Conformist bodies. For fifteen years he was a member of the Old Testament revision committee. Besides the Syriac lexicon and the Bampton lectures, he published: *S. Cyrilli Alexandrinæ Archiepiscopi Commentarii in Lucæ Evangelium Quæ Supersunt Syriace* (1858); *Saint Cyril's Commentary on Saint Luke's Gospel*, in English (1859); *The Third Part of the Ecclesiastical History of John, Bishop of Ephesus, now first Translated from the Original Syriac* (1860); *Catalogi Codicum Manuscriptorum Bibliothecæ Bodleianæ Pars Sexta, Codices Syriacos, Carshunicos, Mendaos Complectens*, and commentaries on Daniel, Jeremiah, Samuel, and Genesis.

PAYSANDÚ, pī'sän-dōō'. A port of Uruguay, situated on the Uruguay River, 170 miles north of Buenos Ayres (Map: Uruguay, F 10). The city has handsome public buildings, a good system of public schools, a library, and several scientific and benevolent societies. Its principal industry is the preservation of beef for the foreign market, especially ox-tongues, to a brand of which it gives its name. It has regular communication by steamer with Buenos Ayres and Montevideo and is the station of a United States commercial agent. The city is the largest in the country next to Montevideo, and had a population in 1898 of 26,000. Paysandú was founded in 1782. It has played an important part in the civil and foreign wars of the Republic.

PAYSANS, pā'zäN', Les (Fr., The Peasants). A gloomy tale by Balzac (1844), of which only the first part appeared before his death. In it he traces the effect produced on economic conditions by the transfer of land-ownership to the peasant class, brought about by the revolutions of 1789 and 1830, and the despoiling of the peasants in turn by the shrewd bourgeois. The strongest character is the usurer Rigou, who is depicted as a scheming, silent, and finally successful sharper.

PAY'SON, Edward (1783-1827). A Congregational minister. He was born at Rindge, N. H.; graduated at Harvard College in 1803; studied theology with his father, the Rev. Seth Payson, pastor at Rindge; and from 1807 till his death was pastor of the Congregational Church at Portland, Maine. His sermons, published at various times, were much read and gave him a wide reputation. His complete works were published with a memoir by Asa Cummings (3 vols., Philadelphia, 1859).

PAYTA, pī'tä. A seaport of Northern Peru, situated at the head of a bay south of Cape Blanco (Map: Peru, A 5). It is a wretched village of 4000 or 5000 inhabitants, but as a port it is the second in importance in the country, and the harbor is one of the best on the Pacific Coast. It is connected by rail with Piura, the capital of the department, and has an important trade with Guayaquil, the exports amounting to over $2,500,000 annually. The chief exports are cotton, tobacco, Panama hats, hides, and salt. The town has a United States consular agency.

PAZ, päs, La. The name of several places in Spanish America. See La Paz.

PAZ, päth, Enriquez de. A Spanish dramatist, commonly called Enriquez Gomez (q.v.).

PAZAND, pä-zänd', or **PAZEND**. See Pahlavi Language and Literature.

PÁZMÁNY, päz'mä-ny', Peter (1570-1637). A Hungarian cardinal and author. He was born at Grosswardein of Protestant parents, but went over to the Roman Catholic Church in 1583, and entered the Society of Jesus. He was an ardent Catholic and carried on almost single-handed the work of the Counter-Reformation in Hungary. In 1629 Urban VIII. made him cardinal. For Catholic education in Hungary he did much by the foundation of the Pazmaneum (1623) in Vienna and of several other schools. His published works were edited by Bognár (Budapest, 1894 et seq.). Consult Schwicker, *Peter Pázmány* (Cologne, 1888).

PAZ SOLDÁN, päs sôl-dän', Mariano Felipe (1821-86). A Peruvian historian and geographer. He was born in Arequipa, studied law there and at Lima, and practiced in both cities. He held high judicial offices in Lima, and was sent to the United States in 1853 to report on penal systems. This mission resulted in the foundation of a detective bureau in Peru and of great improvements in the prisons of the country. Paz Soldán held for many years the post of director of public works. He wrote: *Atlas geográfico del Perú* (1861); *Historia del Perú independiente* (1866); *Diccionario geográfico estadístico del Perú* (1877); and *Historia de la Guerra del Pacífico* (1884).

PEA (modern singular of *pease*, AS. *pise, piose*, pea, from Lat. *pisum*, Gk. *πίσος, pisos, πίσον, pison*, pea), *Pisum*. A genus of plants of the natural order Leguminosæ. The common pea or garden pea (*Pisum sativum*) and the field pea (*Pisum arvense*) are natives of the south of Europe and of Asia. They are both climbing annuals, with pinnate leaves, ovate leaflets, and branching tendrils in place of a terminal leaflet. Peas have been cultivated in the East from time immemorial, and were apparently introduced into Europe very early in the Middle Ages. Their cultivation extends from warm climates, as India, to the cooler regions of the North. The seeds of the garden pea are used for culinary purposes both in a green and in a ripe state. There are two main types of garden peas, those having smooth round seeds, and those with wrinkled seed. The former are the earlier and hardier. The wrinkled varieties are better in quality. Some varieties have edible pods. The green succulent pods of these are eaten in much the same manner as green beans. These are grown to a considerable extent in Europe and offered by seedsmen in America, but are not popular. There are innumerable varieties both of the field pea and of the garden pea. Some of the latter have long stems, and require for their support stakes of six or eight feet in height; others are of humbler growth; and certain dwarf kinds, preferred as most convenient in many gardens, succeed very well without stakes. The largest kinds are sown in rows about four feet apart. A calcareous soil is desirable, but good crops are secured on almost any good wheat or maize soil. Peas are cultivated to a considerable extent as a field crop in the Northern United States and Canada, and both the grain and

straw are used in feeding stock. The plant withstands light frosts, and may therefore be grown as early in spring as the ground can be worked. Semi-dwarf varieties are preferred for field culture, since they lodge less and the crop is more easily harvested.

A plant found on some parts of the shores of Great Britain, as well as of Continental Europe and North America, known as the sea pea, has been commonly referred to the genus Pisum, and called *Pisum maritimum*, although botanists now generally refer it to Lathyrus. It much resembles the common pea; has large reddish or purple flowers on many-flowered stalks; and its seeds have a disagreeable bitter taste. The other species of Pisum are few. But the name pea is often given to species of other papilionaceous genera. The sweet pea (q.v.) and everlasting pea are species of Lathyrus. The chick pea (q.v.) is a species of Cicer.

Food and Feeding Value. Both green and dried peas are much used as articles of diet. The shelled green pea has the following average percentage composition: water, 74.6; protein, 7.0; fat, 0.5; total carbohydrates, 16.9; and ash, 1.0. Dried peas have the following percentage composition: water, 9.5; protein, 24.6; fat, 1.0; total carbohydrates, 62.0; and ash, 2.9. Dried peas are used for soups and purées, cooked in other ways, and sometimes baked like beans. They are rich in protein, and, being readily digested if cooked soft, are a valuable food. As food, green peas are especially prized for their delicate flavor, which is retained when they are properly canned. The varieties with edible pods (pods and seeds) have the following percentage composition: water, 81.8; protein, 3.4; fat, 0.4; total carbohydrates, 13.7; ash, 0.7. Pea meal is too sodden to be fed alone, and should always be mixed with bran, ground oats, or corn meal. Pea vines have the following percentage composition: water, 15.0; protein, 13.7; fat, 2.3; nitrogen-free extract, 37.6; crude fibre, 24.7; and ash, 6.7. In Northern regions peas, especially when ground, replace corn to some extent, and, on account of the large amount of protein they contain, have a high feeding value. See Pea Insects. See Plates of Flowers; Useful Legumes.

PEA'BODY, A town, including several villages, in Essex County, Mass., two miles west of Salem; on the Boston and Maine Railroad (Map: Massachusetts, F 2). It has the Peabody Institute, with a library of 37,000 volumes, established in 1852 by George Peabody, and the Eben Dale Sutton Reference Library. There is a public park (Emerson). The Essex County Agricultural Society is permanently established in Peabody. The city is a manufacturing centre of considerable importance, its products including leather, morocco, shoes, gloves, leather-working machinery, thermometers, electrical supplies, marine hardware, glue, etc. The government is administered by town meetings. There are municipal water-works and a municipal electric light plant. First a part of Salem and then of Danvers, Peabody became a separate town under the name of South Danvers in 1855. In 1868 its present name was adopted in honor of George Peabody, who was born here and lived here for some years. Population, in 1890, 10,158; in 1900, 11,523.

PEABODY, Andrew Preston (1811-93). A Unitarian clergyman. He was born at Beverly, Mass., graduated at Harvard college in 1826, studied in the divinity school, and was tutor in mathematics there. In 1833 he was settled over a Unitarian church in Portsmouth, N. H., where he remained till 1860, when he became Plummer professor of Christian morals and chaplain of Harvard University, retaining this position till 1881. He edited the *North American Review* (1854-63). Among his numerous works are *Lectures on Christian Doctrine* (1844); *Reminiscences of European Travel* (1868); *Manual of Moral Philosophy* (1873); *Christianity and Science* (1874; new ed. 1890); *Christian Belief and Life* (1875); *Moral Philosophy* (1887); *Harvard Reminiscences* (1888); *Harvard Graduates Whom I Have Known* (1890). Consult the memorial sermon by James De Normandie (Boston, 1893).

PEABODY, Cecil Hobart (1855—). An American mechanical engineer, born in Burlington, Vt. He graduated in the department of mechanical engineering at the Massachusetts Institute of Technology in 1877, and in 1893 became professor of marine engineering and naval architecture there. In the interval he had been professor of mathematics in the Sapporo Imperial Agricultural College of Japan (1878), and assistant professor of mechanical engineering in the University of Illinois, and of steam engineering in the Boston Institute. His publications include: *Thermodynamics of the Steam Engine* (1889); *Valve Gear for Steam Engines* (1892); *Steam Boilers* (with Miller, 1897); and *Manual of Steam Engine Indicator* (1900).

PEABODY, Elizabeth Palmer (1804-94). An American educator, born at Billerica, Mass. She was for a time connected with the school of Amos Bronson Alcott, in Boston, of which she wrote an account entitled *A Record of Mr. Alcott's School* (3d ed. 1874); but later she came under the influence of Friedrich Fröbel (q.v.) and was one of the most active in introducing the kindergarten system into the United States. She published a number of works, including: *Crimes of the House of Austria* (1852); *Kindergarten Culture* (1870); *Kindergarten in Italy* (1872); *Reminiscences of Dr. Channing* (1880); and *Letters to Kindergartners* (1886).

PEABODY, Ephraim (1807-56). A Unitarian divine. He was born at Wilton, N. H.; graduated at Bowdoin College 1827, and at the Harvard Divinity School 1830; was settled over a Unitarian church in New Bedford (1838-46), when he became pastor of King's Chapel, Boston, where he remained till his death. He was the founder of the Boston Providence Society. His sermons, with a memoir, appeared in Boston in 1857, and a selection from his writings in 1858 entitled *Christian Days and Thoughts*.

PEABODY, Francis Greenwood (1847—). An American clergyman and theologian, born in Boston. He graduated at Harvard in 1869, and in divinity three years later, was pastor of the First Parish Church in Cambridge, Mass., from 1874 until 1881, when he became Parkman professor of theology in the Harvard Divinity School. Five years afterwards he was appointed Plummer professor of Christian morals at Harvard University. His publications include:

Short Addresses to Young Men on Personal Religion (1896); *Afternoons in the College Chapel* (1898); and *Jesus Christ and the Social Question* (1900).

PEABODY, George (1795-1869). An American merchant and philanthropist, born February 18, 1795, in a parish of Danvers, Mass. (now known as Peabody). Dependent upon himself for support, he went at the age of sixteen or seventeen to Georgetown, D. C., where, in 1813, he became associated with Elisha Riggs, a wholesale dry goods merchant in Georgetown. Twice during the War of 1812 he was a volunteer in the defense of his country. The firm removed to Baltimore in 1815, and afterwards established branches in New York and Philadelphia. In 1829 Peabody became the head of the firm and continued to reside in Baltimore during the next few years. In 1835, as one of three commissioners of the State of Maryland, he negotiated in London a loan of $8,000,000 and declined to receive the large commission to which he was entitled. Later (retaining a branch in Baltimore) he founded the house of George Peabody and Company in London, and there he remained until his death. During his long absence from the United States he maintained the liveliest interest in his native land. This was shown by a liberal gift to promote the American exhibit in the World's Fair of 1851; by a contribution for the second Kane expedition to the Arctic seas; and by a series of banquets on Independence Day, which were attended not only by his countrymen, but by Englishmen of official rank and of other distinctions. During the latter years of his life his gifts increased in amount and were devoted to a great variety of purposes. To his native place he gave about $200,000 to found the Peabody Institute and Library, and to North Danvers $50,000 for a like institution. To the publication funds of the Massachusetts Historical Society and the Maryland Historical Society he contributed $20,000 each, and to the Peabody Academy of Sciences in Salem, Mass., $140,000. To Harvard and to Yale he gave $150,000 each, for the establishment in Cambridge of a museum of archæology, and in New Haven of a museum of natural history. Phillips Academy at Andover, and Kenyon College, in Ohio, received $25,000 each. During the Civil War he gave $10,000 to the United States Sanitary Commission. Three other gifts transcended those which we have already named. As a token of affection to the city of Baltimore, where he laid the foundation of his fortune, he gave more than a million and a quarter of dollars to found the Peabody Institute, which comprises a library, an art gallery, a conservatory of music, and arrangements for the delivery of public lectures and for the bestowal of prizes in the public schools. To the city of London he gave two and a half millions of dollars for the construction of lodging houses—a fund which has since increased enormously. To a separate board, known as the Trustees of the Peabody Educational Fund, he gave more than $3,000,000 to promote education in the Southern States. This is perhaps the most influential of all his gifts. Such munificence, then without parallel, brought him gratitude and honor from England and the United States. The Queen offered to make him a baronet, or to give him the Grand Cross of the Bath; but he declined both honors, and expressed a preference for a letter from the Queen, which he presently received and placed in the Institute at Danvers. Congress caused a gold medal to be struck in acknowledgment of his gifts for education, which had aggregated about $7,000,000. Oxford made him a D.C.L. in 1867.

George Peabody was never married. His death occurred in London, November 4, 1869. His body was brought to the United States by H.M.S. *Monarch*, convoyed by a French and an American vessel, and received by an American squadron. Many eulogies were delivered, of which the most important are those of Robert C. Winthrop (Boston, 1870), S. T. Wallis (Baltimore, 1870), Edward Everett (*Orations*, vol. iii., Boston, 1869), and H. W. Foote (Boston, 1869). A biography has also been published by Phoebe A. Hanaford (Boston, 1870), and a *Brief Sketch* by J. L. M. Curry (Cambridge, 1898). A bronze statue of Peabody, by William W. Story, stands near the Royal Exchange in London and a replica of it in front of the Peabody Institute in Baltimore.

PEABODY, Selim Hobart (1829-1903). An American educator, born at Rockingham, Vt. He graduated at the University of Vermont in 1852, and during the following years held professorships of mathematics, physics, and engineering at several colleges. From 1880 until 1891 he was president of the University of Illinois, and in 1893 was chief of the department of liberal arts at the World's Columbian Exposition. In 1899-1900 he was editor and statistician of the United States Commission to the Paris Exposition, and in 1900 superintendent of the division of liberal arts at the Pan-American Exposition. From 1892 to 1895 he was president of the Chicago Academy of Sciences, and from 1889 to 1891 president of the National Council of Education.

PEABODY-BIRD (named from the *Peabody* Glen in the White Mountains). A local name in New England for the white-throated sparrow (*Zonotrichia albicollis*). It is one of the largest and handsomest sparrows of North America, second in size only to the fox-colored sparrow, from which it differs markedly in color. The peabody-bird is variegated brown, black, and white above, clear gray beneath, with a pure white throat, and prominent black, white, and yellow stripes on the head. It breeds from northern Michigan and New England northward to Labrador, and winters from New England to Florida. It is most remarkable for its very agreeable, though brief, song, consisting of two low soft notes followed by a thrice-repeated triple note clearly whistled. In Massachusetts it is usually interpreted as *I—I, Pea-bod-y, Pea-bod-y, Pea-bod-y;* in Maine, *All day, whit-tle-ing, whit-tle-ing, whit-tle-ing;* in Canada, *Swe-eet Can-a-da, Can-a-da, Can-a-da.*

PEABODY NORMAL COLLEGE. A co-educational training school in Nashville, Tenn., founded in 1875 through a benefaction of $1,000,000 by George Peabody, planned to foster the cause of intellectual development in the South. Dr. Barnas Sears, president of Brown University, became the agent for putting the plan into practical operation, and soon realized the necessity of establishing a college for the specific purpose of training teachers for the

public schools. Nashville was selected as the most favorable location, and upon the offer of the trustees the buildings and endowment of the University of Nashville were accepted as a foundation. The college was opened with thirteen students, under the presidency of Dr. Eben S. Stearns, who was succeeded in 1887 by Dr. William H. Payne. James Davis Porter became president in 1901. The development of the institution has been rapid, as shown by the increase in students from 178 in 1887 to 607 in 1901, when there were 36 instructors. The degree of licentiate of instruction is conferred by the college, and makes the holder eligible without examination for any teaching position in the State. The university confers the degrees of bachelor and master of arts, sciences, and letters. The college is supported by the State, the University of Nashville, and the Peabody Board, which maintains nearly two hundred scholarships, distributed by the general agent of the Peabody Fund. The holder of a scholarship, which is good for two consecutive years, receives $100 per year, and railroad fare to Nashville and return. The college is equipped with well-arranged studios, laboratories, a gymnasium, and a library containing, in 1903, 20,000 volumes. The Winthrop Model School affords opportunity to the students to observe methods of teaching in actual application. In 1902 the building and grounds were valued at $200,000, and the income was about $80,000.

PEABODY EDUCATIONAL FUND. A fund founded in 1867 by George Peabody (q.v.) for the purpose of promoting "intellectual, moral, and industrial education in the most destitute portion of the Southern States." The gift of foundation consisted of securities to the value of $2,100,000, of which $1,100,000 were in Mississippi State bonds, afterwards repudiated. In 1869 an additional $1,000,000 was given by Mr. Peabody, with $384,000 of Florida bonds, also repudiated later. The trustees, chosen from the most prominent public men in the United States, had authority to expend forty per cent. of the principal during the first two years, after which the amount was to remain unchanged for thirty years, when the fund might be used and distributed for educational purposes. The main purpose of the fund was to aid elementary education, and that by strengthening existing schools rather than by founding new ones. Only schools having an attendance of more than 100 and a school period of ten months were to be aided. To such schools $300 was to be given; to those having an attendance of 200, $600 was given; and to those having an attendance of 300, $1000 was given. All grants were made on condition that the district contributed twice as much as the Peabody Board, and in all cases the board worked in unison with State and local school authorities. Especial attention was given to the support of normal schools, particularly those on independent foundations. Scholarships were granted to numerous students of $200 in value, later of $100 and traveling expenses. In 1875 the Peabody Normal School was established at Nashville, Tennessee. The annual distribution of the products of the funds averages about $75,000 per year, and in the thirty years of the Fund, terminating in 1898, a total of more than $2,500,000 was distributed. The States benefited were Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Texas, Tennessee, Virginia, and West Virginia.

Consult: *Reports of the Peabody Educational Fund* (1867 to date), and Dr. J. L. M. Curry's *History of Peabody Educational Fund* (Cambridge, Mass., 1898).

PEACE (OF. *pais, pait*, Fr. *paix*, from Lat. *pax*, peace; connected with *pangere*, Gk. πήγνυναι, *pēgnynai*, to fasten, Skt. *pāśa*, bond, and perhaps with Goth., OHG. *fāhan*, AS. *fōn*, Ger. *fangen*, to seize, take). In law, in a general sense, the internal good order of a community that is violated by the commission of offenses against the law. This general sense is expressed in England by the phrase the 'King's peace,' and in the United States it is commonly called the 'peace of the State or Commonwealth.' It is also sometimes called the 'public peace.' Originally the expression 'the King's peace' was used in a narrower sense with reference to the sanctity of the King's house, or to the special protection of the King's servants, or those to whom he had accorded the same protection.

This general good order or peace was in the earlier days protected only by the hundred court and the ealdormen; but the present special peace officers are the conservators of the peace (in England), justices of the peace, constables, and sheriffs (qq.v.).

Offenses against the public peace are criminal offenses, also known as breaches of the peace, the wrongfulness of which consists either in an act by the offender which is an actual disturbance of public peace and order, as in the case of riot or affray, or an act which is a constructive rather than an actual disturbance of the peace in that it has a tendency only to cause public disturbance or disorder, as unlawful assembly, or seditious libel.

The more common forms of offenses against the peace are riot, affray, forcible entry and detainer, unlawful assembly, challenge to fight, and seditious libel. In addition to these well-defined offenses, there are other offenses against the peace, having no specific name, which are punishable as misdemeanors. Thus, in some States the malicious killing of another's horse and the causing of a disturbance in the home of another have been held to be offenses against the peace.

Forcible entry and detainer is strictly not an offense at common law. It was made so, however, by an early English statute, and is now regarded as a common-law offense.

Seditious libel is an offense against the peace as tending directly to a breach of the peace by giving affront to public opinion, as by libels vilifying officers of the Government, the courts of justice, or even the sovereign or chief officers of a foreign government.

Ordinary libels are also sometimes classified as offenses against the public peace, but they are more properly considered as an independent class of offenses. Consult the authorities referred to under CONSTABLE; CRIMINAL LAW; also Inderwick, *The King's Peace* (London, 1895); Pollock, *The King's Peace*; Pollock and Maitland, *History of English Law* (2d ed., London and Boston, 1899). See AFFRAY; BREACH (of the Peace); FORCIBLE ENTRY AND DETAINER; CONSTABLE; JUSTICE OF THE PEACE, etc.

PEACE CONFERENCE. See HAGUE PEACE CONFERENCE.

PEACE CONVENTION. The name given to a convention held in Washington, on the invitation of Virginia, in February, 1861, just before the outbreak of the Civil War, for the purpose of arranging a peaceful settlement of the difficulties between the North and the South. Fourteen free States and seven slave States were represented, and each State was allowed only a single vote. Ex President Tyler presided over the convention. A committee, upon which each of the twenty-one States was represented, submitted a report, which was adopted, recommending the adoption of certain specified amendments to the Federal Constitution. These amendments generally favored the South, but were not wholly satisfactory to either section, and were not favorably received by either House of Congress. A number of prominent political leaders of the time were members of the convention.

PEACE OF GOD. An attempt of the Church in the latter part of the tenth century and early part of the eleventh century to do away with private warfare. Various synods in France sought to compel persons who were accustomed to bear arms to agree not to use them, but to submit their differences to the judgment of regular tribunals. The method of enforcing these decrees was by spiritual penalties. The whole scheme proved a failure, partly because the nobles loved fighting too well, partly also because there were no tribunals suited to judge differences arising between the nobles. The Church thereupon substituted the so-called Truce of God (q.v.).

PEACE RIVER. One of the largest tributaries of the Mackenzie system, in Western Canada (Map: Canada, F 5). It rises in the north central part of British Columbia, and flows east through the Rocky Mountains, then northeast through Athabasca Territory until it joins by several arms the Great Slave River at the western end of Lake Athabasca. Its length is about one thousand miles, but, though of navigable depth through most of its course, it is obstructed by a number of rapids. Its valley is fertile.

PEACH (OF. *pesche*, Fr. *pêche*, It. *pesca*, *persica*, from Lat. *persicum*, from Gk. *περσικόν*, *persikon*, peach, neu. sg. of *Περσικός*, *Persikos*, Persian, from *Περσίς*, *Persis*, OPers. *Pārsa*, Persia; so called because the first peaches known to the Greeks came from Persia). A deciduous orchard fruit believed to have originated in China, where it has been cultivated from very remote times. It was early introduced into Europe by way of Persia, hence its specific name, *Prunus Persica* (order Rosaceæ). The peach is a small, much branched tree, 15 to 20 feet high, with lanceolate leaves, triplicate buds usually at each node, the two outer of which are flower buds and the middle one a leaf bud, and flowers which usually blossom before the leaves appear. The fruit is a drupe, varying much in size and color of flesh and downy skin. Peaches have been variously classified. Popularly they are separated into two groups—clingstones and freestones. These two classes gradually merge into each other in the different varieties, and even the same variety may be a clingstone or a freestone in different seasons. Price has classified the nearly 300 varieties of peaches grown in North America into the following five races: (1) Peen-To, a flat, medium-sized, greenish white, very early peach, suited for commercial culture only in Florida and some of the Gulf States. (2) South China race. Rather small, oval, somewhat flattened fruit, with an extended recurved apex. (3) Spanish or Indian race. Fruit late, nearly always yellow, with a hairy down. (4) North China race. Fruit large, oval, with slightly recurved beak. (5) The Persian race, which includes the great majority of large, yellow or white fleshed varieties grown in the Northern United States. Certain smooth-skinned peaches are popularly called nectarines. They may originate as seedlings or bud variations ('sports'), and may be propagated and cultivated like other varieties of the peach.

PEACH BLOSSOMS AND LEAVES.

In America peaches are grown in orchards like apples; in England and Middle Europe they are usually trained against walls, or other protection, cultivated in pots and under glass. The tree is hardy, withstanding a winter temperature of —12° to —18° F. Should a few warm days occur in winter and the fruit buds start into growth, they may be easily killed at a much higher temperature. The chief difficulty in peach-growing arises from the danger from late spring frosts. The peach, like the almond, blossoms early unless held in check by cool spring weather or some artificial means; hence, there is often more difficulty in growing peaches in the South than in the North. These facts tend to confine the commercial culture of peaches to particular localities. In America the peach regions include certain more or less continuous areas from Connecticut to Georgia, the eastern and southern shores of the Great Lakes, much of southern Illinois, parts of Missouri, Kansas, and eastern Texas, and nearly the whole of California. Of these different peach areas the most widely known are those located in Maryland, Delaware, Georgia, and Michigan.

Peaches are propagated from seed, which is usually stratified with moist sand in the fall, and left exposed to the freezing and thawing of winter, which softens and cracks the pits. In spring the pits are planted 6 to 8 inches apart in rows wide enough to admit of horse cultivation, and the following August or September the seedlings are budded with improved varieties, since the

peach does not, except in a few instances, reproduce true to seed. (See BUDDING.) In the Southern States the seedlings are often budded in June, and the budded trees are set in the orchard in the fall or following spring. In the North trees budded one fall are allowed to grow the following season before transplanting to the permanent orchard. Peaches thrive best on light, sandy, gravelly, or shaly soils, though larger trees are grown on heavier soils. High or rolling lands are desirable to insure good soil and air drainage, for the peach must be planted in protected localities free from late spring frosts. Early blooming is sometimes delayed by planting on northern or northeastern slopes. Thoroughly whitewashing the trees in fall or winter also has a tendency to delay blossoming. The trees are usually set in the orchard about 20 feet apart each way, though where careful attention is given to pruning and fertilizing, as in some commercial orchards, they may be set as close as 15 feet apart each way. The peach is not a long-lived tree, even under the most favorable conditions, seldom exceeding thirty years. The life of a commercial orchard is seldom more than seven to nine years. The trees come into bearing about the third year after setting in the orchard. The best peach-growers advocate clean cultivation in the orchard up to about the middle of summer, when a cover crop is sown and cultivation stopped. Trees thus treated ripen up their wood better and are less likely to winter-kill than if cultivated longer in the season. Potash and phosphatic fertilizers are most in demand in the peach orchard. By planting leguminous cover crops and turning these under each spring other nitrogenous fertilizers will seldom be required. Barnyard manure is not considered desirable in the peach orchard unless the land is very poor. It affects the quality of the fruit unfavorably and is likely to produce a rank unripened growth of wood.

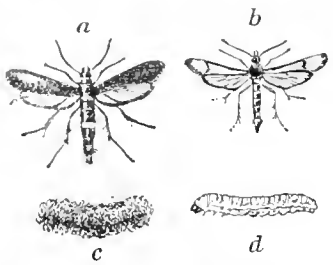
Commercial peach-growers quite generally thin their peaches to stand 5 or 6 inches apart after the usual 'June drop' occurs. Peaches are borne only on wood of the preceding season's growth; hence by carefully heading back this new growth each spring they are really thinned in part at the same time. In heading in it is customary to remove about one-half of the new wood growth of the previous season. In harvesting, the fruits are gathered when full grown and well colored, but before they begin to soften, graded according to size, and marketed in various forms of small packages. Besides being extensively used as a dessert fruit, peaches are canned in enormous quantities, evaporated, and sold as dried peaches, and also used to some extent in the manufacture of peach brandy.

PEACH DISEASES. Among the most serious fungous troubles of the peach are the black spot and the brown or fruit rot. The black spot (*Cladosporium carpophilum*) causes dusky brown or black spots on the side of the fruit. These spots are individually seldom more than $\frac{1}{8}$ inch in diameter, but by coalescence often injure a large area. The tissues underneath become affected and hard, and the peach lop-sided, often cracked. The brown rot (*Monilia fructigena*), which also attacks cherries and plums, causes the rotting of all these fruits as they are ripening, and is one of the most serious diseases to which they are subject. The affected fruits, which turn brown and appear decayed, soon become covered by an ash-colored coating of spores. The disease spreads rapidly, especially among early varieties. The twigs are also likely to be destroyed, and where the flowers are attacked, which evidence seems to show may happen, no fruit is set. These diseases may be largely prevented by thorough spraying with Bordeaux mixture. (See FUNGICIDE.) The fungicide should be diluted about one-third, because the foliage of the peach is very subject to injury from the copper compounds used in spraying. One of the most injurious fungous diseases of the peach tree and foliage is the leaf-curl, due to *Exoascus deformans*. This fungus attacks the leaves, defoliating the tree. Its presence may be ascertained by the occurrence of reddish or yellowish blisters upon the leaves, which become curled or crumpled. This disease is more prevalent in damp, foggy regions than in dry, airy ones. It can be prevented by applying Bordeaux mixture of full strength to the trees before the buds begin to swell, followed after the leaves appear with a single application of the same fungicide, diluted as above. Two diseases of unknown cause are peach rosette and yellows. In rosette the twigs are stunted and the leaves bunched in rosettes. It is mostly confined to the South. The yellows is also shown in the appearance of the leaves. They are narrow, tufted, and of a yellowish color. The fruit ripens prematurely and is streaked through the flesh with red. Both of these diseases are contagious, and diseased trees should be dug out and burned as soon as discovered. Badly infested regions have been rid of the disease in this way.

BIBLIOGRAPHY. For a classification of peaches see Price, *The Peach* (Texas Agricultural Experimental Station, Bulletin 39); Hume, *A Monograph of the Pear-To Group of Peaches* (Florida Agricultural Experimental Station, Bulletin 62); Powell, *A Monograph of the Chinese Cling Group* (Delaware Agricultural Experimental Station, Bulletin 54); Gould, *Peach Growing in Maryland* (Maryland Agricultural Experimental Station, Bulletin 72); Taft, *Peach and Plum Growing in Michigan* (Michigan Agricultural Experimental Station, Bulletin 103); Davis, *Peach Growing in West Virginia* (West Virginia Agricultural Experimental Station, Bulletin 82); *The Peach*, Kansas State Horticultural Society (Topeka, 1899); Fulton, *Peach Culture* (New York, 1899); Smith, *Peach Growing for Market* (United States Department of Agriculture, Farmers' Bulletin No. 33). See PEACH INSECTS. See Colored Plate of DRUPES.

PEACH'AM, HENRY (c.1576-c.1643). An English author, born at North Mimms, Hertford, and educated at Trinity College. In 1606 he published his first volume, *Graphice, or the . . . Art of Drawing with the Pen and Limming in Water Colors*. That he was a fair draughtsman is clear from his illustrations in *Minerva Britannica* (1612), a work on heraldry. After two years of foreign travel, he settled in London, made the acquaintance of Ben Jonson and John Selden, and became well known in literary circles. His best known works are: *The Complcat Gentleman* (1622), of which many editions were published; *The Art of Living in London* (1642); and *The Worth of a Penny, or a Caution to Keep Money* (1641, with imprint, 1647).

PEACH INSECTS. The principal enemy of the peach in the United States is the peach-tree borer, which is the larva of a sesiid moth (*Egeria exitiosa*). The moth, which has partly transparent wings and closely resembles a wasp, is a day flier. It appears in the Northern United States and Canada from about the middle of



PEACH-TREE BORER.

Stages of *Egeria exitiosa*: *a*, adult female; *b*, adult male; *c*, cocoon; *d*, caterpillar.

July to August; in the South, much earlier. Its eggs are laid on the bark of the peach-tree near the surface of the ground. As soon as the larva has hatched it works downward in the bark to the root, forming a tunnel which soon becomes filled with gum. As the larva increases in size, it devours the bark and sap-wood, causing an exudation of gum which ultimately makes a thick mass about the base of the tree. Larvæ of different sizes may be found all through the fall and winter months, and the full-grown ones transform into pupæ within pod-like cases made from the castings mixed with gum and threads of silk. The pupa state lasts about three weeks or more. This insect is not confined absolutely to peach, but sometimes occurs upon plum, and the presence of the larvæ is readily detected by the exudation of gum, when they may be either removed by hand or, after some scraping, the application of hot water is effective to some degree. The best remedy, however, consists in protecting the lower part of the trunk of the tree by a band made of stiff paper or straw.

PEACH-TWIG BORER.

a, a new shoot of peach withering from attack of larva of *Anarsia lineatella*; *b*, the larva (enlarged).

The peach-twig borer (*Anarsia lineatella*) is a moth whose hibernating larvæ injure the trees in early spring, when they bore into the shoots of new leaves, killing the growing terminals and preventing the development of the branch. It is an Old World insect, which has done vast damage on the Pacific coast, and somewhat in the East. It also attacks related fruit trees.

The fruit-tree bark-beetle (*Scolytus rugulosus*) frequently damages the peach, making small holes like shot-holes through the bark. The beetles will lay their eggs by preference in devitalized trees, but will occasionally attack healthy trees. Where this insect is abundant it will be well to girdle one or more trees to be used as traps. The issuing beetles will lay their eggs by preference in the trees thus injured and later they may be cut down and burned.

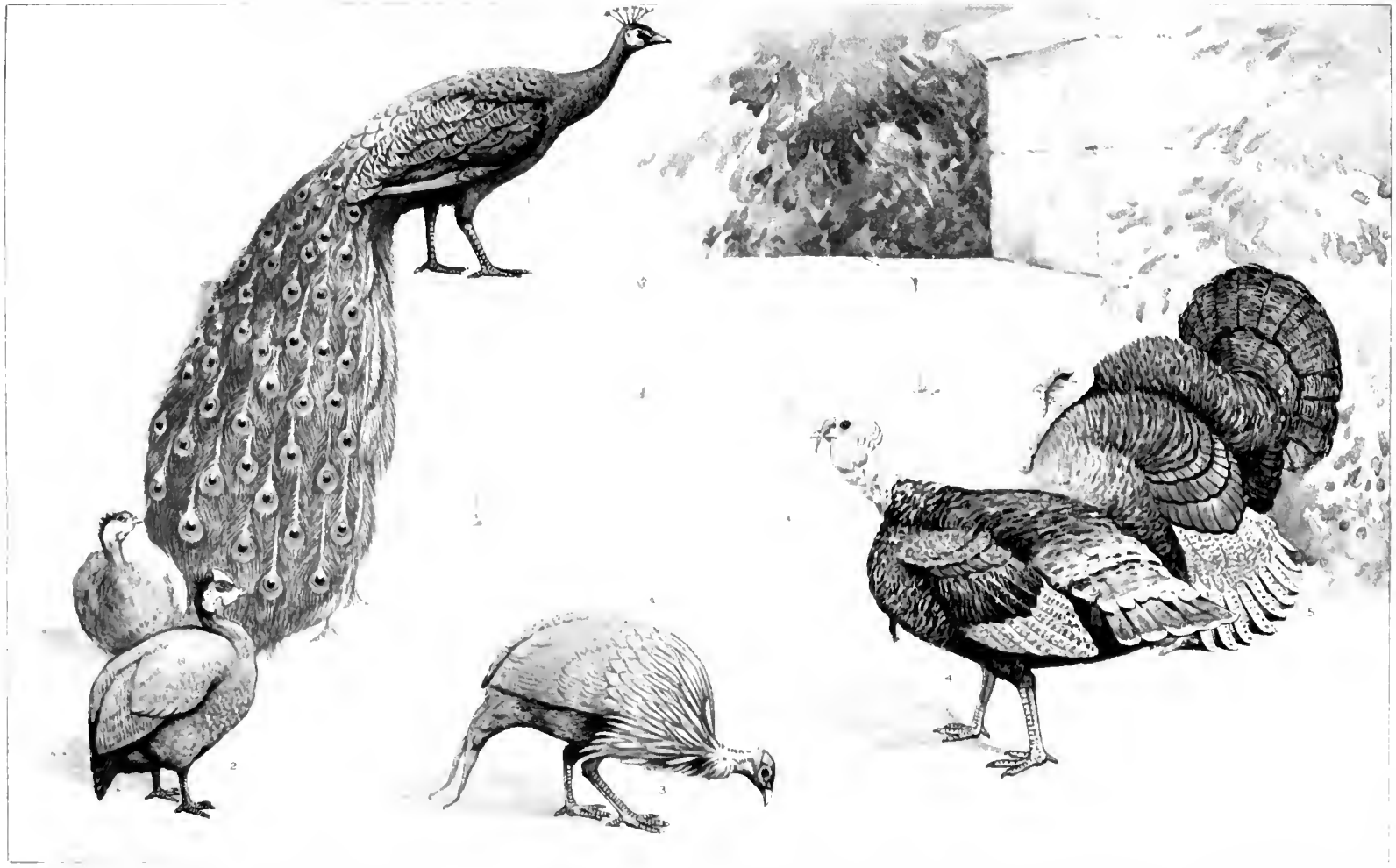
The San José scale is a serious enemy to the peach (see SAN JOSÉ SCALE), while the peach-tree bark-louse (*Lecanium persicæ*) is another scale-insect enemy of this tree. The leaves are attacked by the New York weevil (*Ichthyocerys Novcboracensis*) and by the peach-tree leaf-roller (*Ptycholoma persicana*), as well as by the larva of *Callimorpha Lecontii*. Spraying with an arsenical poison is a remedy against these insects. The peach-tree aphis (*Myzus persicæ*) and the black peach-aphis (*Aphis persicæ-niger*) are the only other enemies of any importance. These are combated by kerosene emulsion.

Consult Saunders, *Insects Injurious to Fruits* (Philadelphia, 1889), and the various circulars and bulletins of the Division of Entomology, United States Department of Agriculture, especially *Farmers' Bulletin No. 80*.

PEACH TREE CREEK, BATTLE OF. A battle fought on July 20, 1864, near Atlanta, between a part of the Federal Army, under General W. T. Sherman and a part of the Confederate Army of the Tennessee, under Gen. John B. Hood. General Joseph E. Johnston had foreseen that General Sherman would probably divide his army in the neighborhood of Atlanta, and had planned to attack at Peach Tree Creek, less than ten miles north of Atlanta, and, if repulsed, to fall back to intrenchments nearer the city. When General Hood succeeded General Johnston, on July 18th, he adopted the plan and ordered General Hardee and General A. P. Stewart to attack the Federal right, consisting of the Army of the Cumberland, under General George H. Thomas, while crossing the stream, July 20th. General Cheatham was to prevent General McPherson from coming to the aid of General Thomas. The attack was ordered to be made at 1 P. M., but was delayed until 4 P. M., by which time the Federal troops had crossed and thrown up rough intrenchments. The artillery was well handled and a furious attack was repulsed with great slaughter. Meanwhile General McPherson had advanced more rapidly than was expected, and General Hood withdrew General Cleburne's division from General Hardee to oppose him, and a further attack was useless. The Federal troops engaged amounted to 21,655 and the Confederate to 20,250. The Federal loss in killed, wounded, and prisoners was 1600; the Confederate, 2500. The result of this battle was to hasten the fall of Atlanta. Consult Johnson and Buel (ed.), *Battles and Leaders of the Civil War*, vol. iv. (New York, 1887).

PEACOCK (from *pea*, AS. *pawa*, from Lat. *pavo*, peacock, connected with Gk. *ταώς*, *taos*, Pers., Ar. *tawus*, *taus*, peacock + *cock*, AS. *coc*, Bret. *kok*, Alb. *cocos*, Skt. *kukkuta*, cock, onomatopoetic in origin), or PEAFOWL. A kind of pheasant of which only two species are known, natives of the East Indies; birds of a large size, and somewhat remarkable for magnificence of plumage. The bill is of moderate size, somewhat arched toward the tip; the cheeks nearly naked; the head crested; the tarsi rather long, and armed with a single spur; the wings short; the upper tail-coverts prolonged far beyond the tail and forming a splendid train capable of being erected and spread out into a great disk, the true tail being at the same time erected to sup-

PEACOCK, TURKEY & GUINEA-FOWL



1 PEACOCK PAVO CRISTATUS
2 GUINEA-FOWL NUMIDA MELEAGRIS
3 VULTURINE OR ROYAL GUINEA-FOWL NUMIDA VULTURINA
4 DOMESTIC TURKEY
5 WILD TURKEY MELEAGRIS GALLOPAVO

port it. The common peacock (*Pavo cristatus*) has for crest an aigrette of 24 upright feathers, with slender almost naked shafts and broad tip. The tail consists of 18 brown stiff feathers, and is about six inches long. The train derives much of its beauty from the loose barbs of its feathers, while their great number and unequal length contribute to its gorgeousness, the upper feathers being successively shorter, so that when it is erected into a disk the eye-like or moon-like spot at the tip of each feather is displayed. The blue of the neck; the green and black of the back and wings; the brown, green, violet, and gold of the tail; the arrangement of the colors, their metallic splendor, and the play of color in changing lights, render the male peacock an object of universal admiration—a sentiment in which the bird himself seems to participate, as he struts about to display himself. When the disk is erected, the peacock has the power of rattling the shafts of its feathers against one another in a very peculiar manner, by a strong muscular vibration. The peahen is much smaller than the adult male bird, has no train, and is of dull plumage, mostly brownish, except that the neck is green. Individuals with white plumage not infrequently occur, in which even the eye-like spots of the tail are but faintly indicated; and pied peacocks have the deep blue of the neck and breast contrasted with pure white. The 'japanned peacock' (*Pavo nigripennis*) is probably a variety; it has deep blue wing-coverts and the female is grayish white.

The peacock is generally supposed to have been known to the Hebrews in the time of Solomon, but it is not certain that the word commonly translated 'peacocks' in the account of Solomon's importations from Tarshish (II. Chronicles ix. 21) does not signify *parrots*. It is commonly stated that it first became known to the Greeks on the occasion of Alexander's expedition to India, but Aristophanes mentions it in plays written before Alexander was born. It has taken a considerable part in the folk-lore and religious history of most peoples familiar with it. It is regarded as sacred by various Indian castes, was made the emblem of certain classic divinities, and its plumes are still thought 'unlucky' by many persons. The peacock became common among the Greeks and Romans; a sumptuous banquet in the latter days of Roman greatness was scarcely complete without it; and wealth and folly went to the excess of providing dishes of peacocks' tongues and peacocks' brains. Throughout the Middle Ages, also, a peacock was often presented at the tables of the great, on state occasions, the skin with the plumage being placed around the bird after it was cooked.

The peacock is now common in most parts of the world; generally kept, however, except in warm countries, for ornament rather than profit, although both the flesh and the eggs are very good. It readily partakes of all the ordinary food provided for the poultry yard, and is fond of buds and succulent vegetables. It is hardy enough even in cold climates, except that few eggs are laid and the young are difficult to rear. The adult birds sit on trees or on the tops of houses or stacks during the keenest frosty nights, never, if they can avoid it, submitting to the confinement of a house. A sketch of its history in civilization will be found in Stallybrass's English translation (London, 1891) of Hehn's work entitled *Cultivated Plants and Domestic Animals in Their Migrations*. Peacocks are found wild in almost all parts of India and Siam. In general habits they resemble other pheasants. They roost at night in trees, for safety, but find their food and make their nests on the ground. When alarmed on the ground the bird cannot readily take wing, and is sometimes run down by dogs or by horsemen. The female lays about ten eggs, dirty brown in color.

The other species is the Javanese peacock (*Pavo muticus*), a native of some of the southeastern parts of Asia and neighboring islands. It is nearly equal in size to the common peacock, but of perhaps more brilliant although very similar plumage. The cheeks and around the eyes are yellow; the neck, and other fore parts, greenish with golden reflections. The crest is longer than that of the common peacock, its feathers less equal, and webbed along their whole length. Consult the works of Jordan, Hume, Oates, Legge, Seebohm, Blyth, and other writers on East Indian ornithology; Darwin, *Variation of Animals and Plants Under Domestication* (2d ed., London, 1875); Gubernatis, *Zoological Mythology* (ib., 1872); De Kay, *Bird Gods* (New York, 1898). See Plate of PEACOCKS, ETC.

PEA'COCK, EDWARD (1831—). An English antiquary, born at Hemsworth, in Yorkshire, December 22, 1831. He was educated by private tutors. In 1857 he was elected fellow of the Society of Antiquaries. His antiquarian works comprise mainly the *Army List of Roundheads and Cavaliers* (1863; enlarged 1874); *Instructions for Parish Priests, by John Myre* (Early English Text Society, 1868); *A List of the Roman Catholics in the County of York, in 1604* (1872); *Index to English-Speaking Students Who Have Graduated at Leyden University* (Index Society, 1883); *The Monckton Papers* (Philobiblon Society, 1885). Between 1870 and 1874 he published three novels.

PEACOCK, GEORGE (1791-1858). An English mathematician and divine, born at Thornton Hall, Denton. He was educated at Richmond, and at Trinity College, Cambridge, where he became second wrangler (1813), fellow (1814), and tutor and lecturer (1815). He was a fellow student with Herschel, Babbage, and Woodhouse. These four translated Lacroix's *Differential and Integral Calculus* (1816), and were instrumental in the introduction of the Continental notation of the calculus into Cambridge. In 1836 he was elected Lowndean professor of astronomy at Cambridge, which office he retained until his death, although he soon treated it as a sinecure. In 1839 he became Dean of Ely and removed thither. Peacock was one of the founders of the Cambridge University Philosophical Society (1819), Fellow of the Royal Astronomical, Geological, and other societies. In 1838 and 1843 he was member of the commission for standard weights and measures, and advocated a system of decimal coinage. In 1850 he was member of the royal commission and in 1855 of the Parliamentary commission for drawing up new statutes for the university and colleges. His principal mathematical works are: *Collection of Examples of the Application of the Differential and Integral Calculus* (1820); contributions to the *Encyclopædia Metropolitana* (1825-26); *Treatise on Algebra* (1830; 2d ed., 2 vols., 1842-

45); *Report on the Recent Progress of Certain Branches of Analysis* (British Association Reports, 1834); *Remarks on Decimal Nomenclature of Coins, Weights, and Measures* (1841). He also wrote the *Life of Thomas Young* (1855).

PEACOCK, Thomas Love (1785-1866). An English novelist and poet. He was born at Weymouth, October 18, 1785, and, his father dying soon afterwards, was educated in a somewhat desultory fashion at home and at a private school until he was thirteen. He made his first publication, in poetry, before he was twenty, but his independent poems have not added much to his fame. In 1812, on one of his tours in Wales, he made the acquaintance of Shelley and his wife, Harriet, and for several years the friendship then begun is the most notable thing in his life. Shelley made him his executor, with Byron, and it is to him that we owe our best materials for the poet's biography. In 1816, by the publication of *Headlong Hall*, he 'took his station and degree' in literature, which was not to be materially altered in the course of a long life. At the beginning of 1819, by the happy custom of the times, he obtained an important position under the East India Company because he was a clever novelist and a good Greek scholar. With James Mill, he was appointed one of the examiners of Indian correspondence, a post demanding statesmanlike qualities and business ability not always found in a poet and novelist. He continued at India House for thirty-eight years, succeeding Mill as chief examiner in 1836, and finally retired on an ample pension, to live thenceforth quietly with his books and his garden, at Halliford, on his beloved Thames, until his death, January 23, 1866.

Though the charming ballads scattered throughout his books show undoubted poetic ability, it is as a satirist that Peacock will be principally remembered. He describes *Maid Marian* (written 1818, published 1822) to Shelley as "a comic romance of the twelfth century, which I shall make the vehicle of much oblique satire on all the oppressions that are done under the sun"—a phrase which, if we widen it to include the oppressions of cant and ignorance, is not a bad summary of the most of his work. In the ordinary qualifications of the novelist—plot-construction, human interest, character-drawing—he is deficient. But in genial satire (aided by a real passion for beauty and a singularly pure and elegant style) he has had few equals in recent literature; in fact, his fiction has been called by a good judge the best modern representative of the Aristophanic comedy. His characters, despite their suggestion of Shelley or Coleridge or Canning, are rather types than real people; like Ben Jonson and his school, he presents 'humors' in preference to men. His other books are: *Melincourt* (1818); *Nightmare Abbey* (1818); *The Misfortunes of Elphin* (1829); *Crotchet Castle* (1831), which contains his highest comedy; and *Gryll Grange* (1861), the mellow product of his old age. His principal works were published in collected editions in 1875 (ed. Sir Henry Cole) and 1891 (ed. Garnett), with valuable critical and biographical matter. Consult also Saintsbury, in *Essays in English Literature, 1780-1860* (1st series, London, 1890).

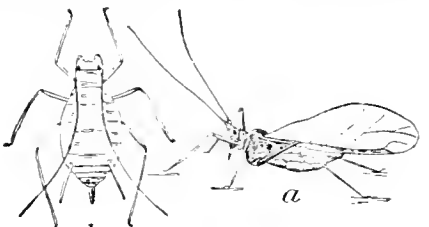
PEACOCK-FISH. A gorgeous European wrasse (*Ctenilabrus pavo*).

PEACOCK-PHEASANT. A pheasant, closely allied to the peacocks, of the genus Polyplectron, of which several species inhabit the Indo-Chinese region and the neighboring islands. The best known species is *Polyplectron Chinquis*, which is brown with a black head, and has the upper plumage adorned with large ocelli resembling those of a peacock's tail. They frequent the forests of hilly regions. The female has the peculiar habit of using her large tail as a shelter for her young. These birds have two great spurs upon the heel, which are especially strong in *Polyplectron bicalcaratum* (see Plate of Pheasants) of the Malay Peninsula.

PEA INSECTS. The pea in Europe is attacked by seven species of weevils, by the larvæ of seven species of moths, and by two species of flies. In the United States there are probably twenty species of insects which are especially injurious to this crop. The pea-weevil (*Bruchus pisorum*) is very abundant. It probably originated in Oriental regions, is scarcely known in the colder countries of Europe and Canada, but is very abundant throughout the United States—so abundant, in fact, that in eating green peas we consume a larva or grub with nearly every pea. The beetles appear on the vines when the peas are in blossom, and the eggs are deposited singly upon the surface of the pods. The larva bores through the pod into a pea, and when full-grown transforms to pupa, the adults issuing at varying periods from the end of July until late in the autumn, frequently in the Northern States remaining in the pea until the following spring, when many are planted in the seed. The insect hibernates in the adult condition and has only a single generation each year. It does not breed in dried peas, and the new generation for another year is dependent upon the beetles which are contained in planted seed or which escape from the store-room. The simplest and most effective remedy consists in holding seed peas in a closed receptacle over one year; the beetles which issue die without being able to lay their eggs in the field. Late planting is also frequently effective, and weevilly peas may be made safe by fumigation with bisulphid of carbon.

Certain of the blister-beetles are frequently injurious to both beans and peas by devouring the leaves, particularly the ash-gray blister-beetle (*Macrobasis unicolor*), which also feeds upon other leguminous plants. The beetles are abundant in June and July, and are handled by spraying with Paris green or by driving them, in the early morning, into windrows of straw or hay, where they are burned. In their early stages these insects are beneficial by destroying the egg-pods of grasshoppers. The maturing pods of peas and cowpeas and other leguminous plants are frequently damaged by the boll-worm or corn-ear worm (larva of *Heliothis armiger*); and the young plants as they come from the ground are frequently damaged by cutworms. (See Cutworm and Owlet Moth.) The European pea-moth (*Semasia nigricana*) has been introduced into Canada, where it has injured peas for a number of years. It is probably only a question of time when it will make its appearance in the Northern United States. A plant-bug (*Halticus Uhleri*) damages peas and beans in some of the Central States, and several species of leaf-hoppers infest the plant.

The most serious enemy to the pea crop of recent years has been the destructive green pea-louse (*Nectarophora destructor*), which caused a loss of many hundreds of thousands of dollars to pea-growers in the United States during 1899 and 1900. During the first season of its abundance it overran and laid waste fields of peas from Nova Scotia and Maine to Virginia and Maryland, as well as in neighboring States, destroying about 50 per cent. of the crop. The loss during 1899 was estimated at $3,000,000, and during 1900, as early as June 15th, at $4,000,000. The insect multiplies with great rapidity, and in favorable seasons is always likely to do enormous damage. The remedies which have been employed are spraying with kerosene soap emulsion and the use of the brush and cultivator method. In the latter case, the peas have been grown in rows sufficiently wide apart to admit of a one-horse cultivator, and the lice are brushed from the plants with boughs of pine, the cultivator following immediately afterwards and burying the lice. Early planting and



GREEN PEA-LOUSE.

a, Winged female of *Nectarophora destructor* in feeding position; *b*, wingless female.

very late planting have also been advised, but rotation of crops by which no leguminous crop immediately follows another one offers apparently the best chance of immunity. Consult: Chittenden, *Insects Injurious to Beans and Peas;* and *The Destructive Green Pea Louse* (Department of Agriculture, Washington, 1901).

PEALE, pēl, Charles Wilson (1741-1827). An American portrait painter and author. He was born at Chesterton, Md., April 16, 1741. In 1768-69 he lived in Boston, where he studied with Copley, and in 1770 went to London, where he was a pupil of Benjamin West. In 1774 he returned to America and practiced portrait painting at Annapolis, and two years later settled in Philadelphia. He fought in the Revolution, commanding a company at Trenton and Germantown, and painted the portraits of many prominent Revolutionary officers. He painted fourteen likenesses of Washington, the earliest of which represents him in the uniform of a Virginia colonel, and is the only one surviving of those painted before the Revolution. The most notable one, ordered by Lafayette for the French King, was purchased during the French Revolution and presented to the National Institute, where it is still preserved. Another portrait of Washington was painted in 1780 for Princeton College. Other portraits include those of Lincoln, Greene, Rochambeau, Reed, Gates, De Kalb, Jefferson, Jackson, and Clay. There is a portrait of Hamilton in the New York Historical Society. At eighty-one years of age he painted "Christ Healing the Sick," and two years later a portrait of himself, which is now in the Philadelphia Academy. He died in Philadelphia, February 22, 1827. Consult: Dunlap, *History of the Arts of Design in the United States* (New York, 1834); Johnston, *Original Portraits of Washington* (Boston, 1882).

PEALE, Patrick. The pseudonym of the German poet and novelist Gustav Anton von Seckendorff (q.v.).

PEALE, Rembrandt (1778-1860). An American portrait and historical painter and author. He was born in Bucks County, Pa., February 22, 1778, the son and pupil of Charles Wilson Peale. From 1796 to 1801 he practiced portrait painting in Charleston, S. C., and then went to London, where he studied under West, returning to the United States in 1803. In 1807 and again in 1809 he visited Paris, where he painted the portraits of distinguished Frenchmen. In 1810 he returned to America and practiced portrait painting at Philadelphia, New York, Charleston, and at Baltimore, where he established a museum and picture gallery. In 1829 he went abroad again, visiting France and Italy, and in 1833 he established himself in London. Peale painted several portraits of Washington, the most notable of which, executed in 1823, was exhibited in Rome, Florence, and London, and was bought by Congress upon his return to America in 1832. His other works include the "Court of Death" (1820), in private possession, Saint Louis; the "Roman Daughter" (1810), Boston Museum; and the "Ascent of Elijah;" portraits of Gilbert Stuart, Thomas Jefferson, and Mrs. Madison, New York Historical Society; of Cuvier and Houdon, Pennsylvania Academy; and an equestrian portrait of Washington, Independence Hall, Philadelphia. He was also a skillful lithographer, and in 1827 won a silver medal at the Franklin Institute, for a portrait of Washington. He lectured on natural history, and is the author of *An Account of the Skeleton of the Mammoth* (London, 1802). His other publications include: *Notes on Italy* (Philadelphia, 1831); *Graphics* (1841); and *Reminiscences of Art and Artists* (1845). He died in Philadelphia, October 3, 1860.

PEAN, pēn (OF. *pane, panne*, Fr. *panne*, skin, fur, from ML. *panna, pannus*, skin, from Lat. *pannus*, cloth, or *penna*, feather). One of the furs borne in heraldry (q.v.).

PEANUT (*Arachis hypogæa*). An annual plant of the order Leguminosæ, also called groundnut, earthnut, ground pea, goober, and pindar in various localities. It grows from one to two feet high with thick, greenish, hairy stems and spreading branches. After the flower has fallen the peduncle bends downward and pushes into the ground, where the fruit or pod develops. The pods are pale yellowish, wrinkled, slightly curved, often contracted in the middle, and contain from one to three seeds. The peanut is thought to be a native of Brazil, where a number of species of the genus are indigenous. Soon after the discovery of South America it was introduced into the Old World and is now grown in all the warm regions of the globe. Only since 1866 has it been an important crop in the United States, where it is mainly grown in the Southern and Southeastern States, particularly Virginia, North Carolina, Georgia, and Tennessee. The conditions best suited to the culture of the peanut are an early and warm spring, a hot and moist summer, and a limy, sandy, friable loam. Lime in some

form must be added to soils deficient in this element. The soil is finely pulverized from four to five inches deep and the seed planted about one inch deep in rows from 28 to 36 inches apart and from 12 to 16 inches in the row, when danger of late spring frosts has passed. About two bushels of nuts in the pod are required to plant an acre. After planting and during the growing period of the crop the soil is kept loose and open and free from weeds. The crop is harvested before frost in the fall, the plants being loosened by means of a special plow, then taken up and put into shocks. After drying from fifteen to twenty days the pods are picked. Fifty bushels of pods and from one to two tons of hay or straw per acre is considered a good yield. In special establishments known as recleaners or factories the pods are polished and sorted before being put upon the market.

Feeding Value. Peanuts are used as a forage crop and as hay. The ripe nuts and the cake which remains after the oil is expressed are also fed. The percentage composition of a number of peanut products follows:

Composition of Peanut Kernels, Forage, etc.

	Water	Protein	Fat	Nitrogen free extract	Crude fibre	Ash
Peanut kernels	7.9	27.2	45.3	13.1	3.9	2.6
Peanut vines (green)	31.9	7.4	3.4	27.1	22.0	8.2
Peanut hay	7.8	10.8	1.7	43.6	20.4	15.7
Peanut hulls (shells)	12.9	6.3	2.3	16.9	58.6	3.0

Peanut kernels resemble other leguminous seeds in being rich in protein. The fat content is also high. Since peanut hay is apt to contain considerable dirt, it should be fed from low mangers or troughs. If immature pods are left on the vines, no other food is necessary during the winter. It has been estimated that pigs under 100 pounds would make from $12 to $20 worth of pork from an acre of peanuts if fed a moderate allowance of corn or corn meal in addition. Pasturing pigs has the advantage that the animals gather the crop and save the cost of harvesting. Peanuts make a soft pork and lard, a disadvantage that may be overcome by feeding corn exclusively for a month before slaughtering. Peanut cake mixed with less concentrated feeds has been found to be a useful cattle food. A material called 'peanut meal' is made by grinding peanut hulls, immature peanuts, and those of an inferior grade.

Peanuts as Food. Of the 4,000,000 bushels of peanuts raised yearly in the United States, 3,000,000 bushels are used as roasted peanuts. Many nuts are used in the manufacture of confectionery and peanut butter. The latter is prepared by grinding the nut and generally mixing it with a little water. Peanut oil is made in large quantities in Europe from African-raised nuts. The shelled nuts contain 30 to 50 per cent. of oil, which, if carefully made, is of good flavor, and is used for various culinary purposes and in the arts. The peanut is at present used more as a luxury or for eating at odd times than as a staple article of diet. It is, however, wholesome, nutritious, and cheap. Little is definitely known concerning its digestibility. It is apparently more easily digested if eaten with other foods than if eaten alone. Attempts to introduce peanut soups, cakes, etc., into the diet have not proved very successful. See Plate of Useful Legumes.

PEA ORE. A form of compact brown or red hematite, consisting of round smooth grains, from the size of mustard-seed to that of small pease. Sometimes the grains are still smaller and flattened. The Clinton iron ore, found in the Silurian of the Eastern United States, is often of this nature.

PEAR (AS. *peru, pere*, from Lat. *pirum*, pear, *pirus*, pear-tree; connected with Gk. *ἄπιος, apios*, pear). A deciduous orchard fruit (*Pyrus communis*) of temperate climates, belonging to the rose family, a native of Europe, early introduced into America. This species is the parent of thousands of cultivated varieties. The small apple-shaped, gritty sand or Chinese pear (*Pyrus Sinensis*) is seldom grown except for ornament and as a stock, the fruit being inedible unless baked or preserved. Some hybrids between these two species have arisen, two of which, Le Conte and Kieffer, are among the most important commercial varieties grown in America. Pear orchards resemble apple orchards in appearance except that the trees naturally grow much more pyramidal. When left to themselves they frequently grow to a height of 60 feet or more. Pear flowers are usually white and borne on spurs that continue to bear fruit and to branch for years. The fruit is a pome, more juicy and melting or buttery than the apple, and less tart. It is one of the best dessert fruits, and is extensively used for canning, preserving, etc., and in some parts of Europe large quantities are used in the production of cider or perry.

While pears are grown over a wide territory in the temperate zones, the countries of largest production are France and the United States. In America they stand fourth in importance among the orchard fruits. The best American pear districts are found in the Northeastern States, from New England west to the Great Lakes, and in California and parts of Oregon and Washington. Blight seriously interferes with pear-growing in the South, while in the Northwest only the inferior Russian sorts are hardy enough to thrive. The pear is grown in orchards, either as a standard or dwarf. Standard trees are produced by grafting or budding the variety which it is wished to grow upon a seedling pear; the best stock for the purpose is obtained by growing the seed of the wild pear of Europe. Dwarf trees are produced by grafting or budding on quince stock. Pears thus treated seldom grow more than 12 to 15 feet high. They come into bearing earlier than standard trees, usually within four years from planting in the orchard, and are especially valuable where land is expensive or for planting between other trees. Frequently dwarfing increases the size of the fruit and improves its quality.

The best soil for standard pears is a well-

drained heavy clay loam. Dwarf pears will do well on lighter soils. Rapid growth is not sought for in pear culture, since it is believed to favor the attacks of blight. For this reason, also, stable or other nitrogenous manures are not advocated for the pear orchard except on very poor soils. Trees are set in the orchard when two or three years from the bud, standard trees from 18 to 25 feet apart each way, and dwarfs 10 to 16 feet. Dwarf trees are set deep, 4 to 6 inches below the union, to prevent growth of the stock and to lessen the danger from breaking off in storms. Cultivation is practiced only during the spring and early summer in order to prevent a late, sappy wood growth. Recent investigations have clearly shown that many varieties of pears are self-sterile and must be planted with other varieties to cross-pollenize them in order to produce fruit. Such varieties should therefore never be planted in orchards alone. It is probable that almost any variety blossoming at the same time as these self-sterile sorts may be used as pollenizers. In the orchard one or two rows of one variety should be alternated with one or two rows of another variety blossoming at the same time.

Pears are harvested before they are fully ripe and while they are still hard. Thus handled they acquire a better color and flavor, develop less grit in the flesh, and are less likely to decay at the core than when allowed to ripen on the tree. After picking they are stored in shallow boxes or racks in a cool room away from all draughts of air, which tend to shrivel up the fruit. Late winter pears may be left on the trees as long as practicable before frost. Pears grown for market are gathered and placed in barrels or boxes at once. European and California fancy pears are wrapped in paper like oranges before marketing.

PEAR DISEASES. The pear and its fruit are subject to the same diseases as the apple, for the description and prevention of which see APPLE, paragraph *Diseases*. In addition there are two diseases which, although occurring upon the apple and quince, are so much more frequent upon the pear as to be generally associated with it. The first is the leaf-spot, due to the fungus *Entomosporium maculatum*, which occurs upon the leaves, fruits, and young twigs; upon the leaves as reddish brown spots which coalesce more or less, and destroy the leaf, sometimes defoliating the tree; upon the stems black, as dead spots; upon the fruit reddish spots beneath which the tissues become hard and cork-like, the fruit often cracking and rotting as a result of the attack. This disease may be easily controlled by the application of Bordeaux mixture or other fungicide (q.v.). The second is pear-blight or fire-blight (q.v.).

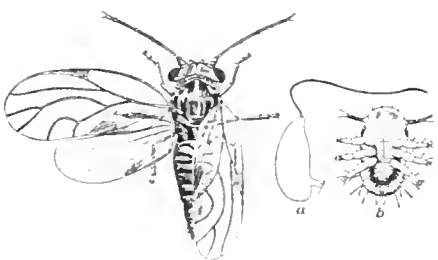
Consult: Quinn, *Pear Culture for Profit* (New York, 1889); Waite, *Pollination of Pear Flowers*, United States Department, Agricultural Division Vegetable Pathology, Bulletin No. 5 (1895); Field, *Pear Culture* (New York, 1863); Bailey, article "Pear," in *Cyclopedia of American Horticulture* (New York, 1900-02); Jordan, *Pear Growing in New Jersey* (New Jersey Experimental Station, Bulletin 142). See PEAR INSECTS; Plate of FLOWERS.

PEAR, PRICKLY. A species of cactus. See PRICKLY PEAR.

PEARCE, pērs, CHARLES SPRAGUE (1851—). An American figure painter, born in Boston, Mass. He studied under Bonnat in Paris, and was a frequent exhibitor at the Salon. Afterwards he lived many years in France. He was one of the first members of the Society of American artists. In 1891 he was awarded the Grand Diploma at the Berlin Exhibition, and in 1894 was made an officer of the Legion of Honor. His work is in the realistic French manner, quiet in tone, with notable technical qualities and skill in composition. Among his best known pictures are: "Death of the First Born" (1877); "The Shepherdess" (1866); "Fantaisie" (in the Pennsylvania Academy of Fine Arts); and "Meditation" (in the Metropolitan Museum, New York City). He did some mural painting in the north hall of the Congressional Library in Washington.

PEA RIDGE, BATTLE OF. A battle of the Civil War in America, fought at Pea Ridge, in northwest Arkansas, near the Missouri boundary, March 7 and 8, 1862. In January, 1862, Gen. S. R. Curtis with 10,500 Federal troops, composing the Army of the Southwest, moved against Gen. Sterling Price, commanding Missouri State troops at Springfield. General Price retired into Arkansas, where he was joined by Gen. Benjamin McCulloch with his division, and General Van Dorn took chief command. General Curtis followed and took a strong position at Pea Ridge, on an eminence in the Ozark Mountains, and awaited an attack. General Van Dorn advanced with 14,000 men and was joined by Gen. Albert Pike with a brigade of Indians, which had been recruited in Indian Territory. His plan was to strike the rear of the Federal army and cut off its communications. General Curtis had changed front, but the Federal right was driven back two miles on March 7th. The attack by the Confederates on the Federal left was repulsed with great slaughter, Generals McCulloch and McIntosh being among the killed. The Indians were entirely useless, and scattered at the beginning of the artillery fire. The next morning General Van Dorn retreated under cover of his artillery, but General Curtis drew his men into an arc of a circle and poured in a destructive cross fire. The Federal loss was 1384 killed, wounded, and prisoners; the Confederate was given at 800 exclusive of Indians, but was undoubtedly larger. The result of this first victory west of the Mississippi saved Missouri to the Union cause.

PEAR INSECTS. The insects attacking the pear are identical in many instances with those which attack the apples, the apple-borers, the



PEAR PSYLLA.

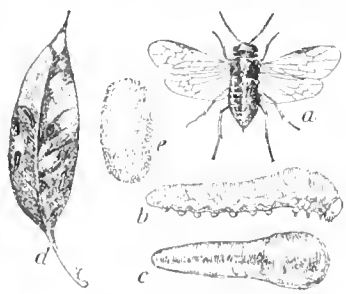
Psylla pyricola: adult; an egg (*a*); and larva (*b*) from beneath. Greatly enlarged.

San José scale, the oyster-shell bark-louse, and the codling moth all being found to attack the pear. The pear-tree psylla (*Psylla pyri*) is con-

fined to the pear, and is common and rather destructive in the Northern United States, extending westward as far as Michigan and southward to Maryland and Virginia. It was probably imported about 1832 from Europe, where it occurs abundantly, especially in Austria. The orange-yellow eggs are laid by the adult insect upon the leaves of the trees, and the young insects, yellow in color, with crimson eyes, begin immediately to suck the sap from the leaf. It grows rather rapidly and has several generations (four or five) in the course of summer. It hibernates in the adult condition. It is preyed upon by a large number of natural enemies, principally by the golden-eyed lace-wing flies and the larvæ of coccinellid beetles. The best remedy is a spring application of kerosene emulsion spray when the leaves are first unfolded. A combination of kerosene emulsion and Bordeaux mixture is recommended where pear-blight occurs in the same orchard.

A bark-boring beetle, known as the pear-blight beetle (*Xyleborus pyri*), frequently causes the death of many twigs of the pear tree by making small perforations at the bases of the buds. The adult beetle deposits its egg on the bud and the young larva bores down, following the course of the eye of the bud, toward the pith, around which it passes, consuming the tissues in its course, thus interfering with the circulation, and causing the twig to wither. The adult insect issues in June or July and deposits its eggs during August. The only remedy which has been suggested is to cut off the blighted limbs below the injured part and burn them before the beetle has escaped. Another borer, the sinuate pear-borer (*Agrilus sinuatus*), has been introduced into the United States from Europe within recent years. This borer in the larval condition feeds between the bark and wood in pear trees, especially in the trunk and larger branches, making long zigzag galleries, finally girdling the tree and killing it. It lives two years in the larval condition.

Among the numerous insects which attack the leaves of the pear is the so-called 'pear slug,' which is the larva of a sawfly (*Eriocampoides limacina*). The adult is a small insect, smaller



PEAR SLUG.

a, adult saw-fly, female; *b*, larva with slime removed; *c*, larva in normal state (the 'slug'); *d*, an affected leaf; *e*, cocoon.

than the house-fly, and glossy black in color. It was probably introduced into the United States from Europe toward the close of the eighteenth century. The eggs are laid under the surface of the leaf, and the young larvæ hatch and grow rapidly, covering themselves with a slimy secretion. There are two generations each year, and the larvæ when abundant skeletonize nearly all the leaves on large trees. The best remedy is to spray with an arsenical wash or with a soap solution, or hellebore may be used either as a dry powder or as a wet spray. Heavy rains will often destroy them, and a forcible water spray will wash them from the leaves.

Among caterpillars which feed upon the pear are the white-marked tussock-moth (*Orgyia leucostigma*), the red-humped apple-tree caterpillar (*Notodonta concinna*), the fall webworm (*Hyphantria cunea*), the cecropia moth (*Attacus cecropia*), the eye-spotted bud-moth (*Tmetocera ocellana*), and others. The plum curculio and the quince curculio (qq.v.) injure pears, as well as plums and quinces, although not so extensively. Consult: Saunders, *Insects Injurious to Fruits* (Philadelphia, 1889); Smith, *Manual of Economic Entomology* (Philadelphia, 1896).

PEARL (from ML. *perula*, *perulus*, *perla*, pearl, probably variants of *pirula*, diminutive of Lat. *pirum*, pear). A morbid product formed from the pearly nacre of the interior of the pearl mussel (*Meleagrina margaritifera*) and other bivalves. It is often due to the irritation caused by the presence of a grain of sand or some other foreign body lodged between the mantle of the animal and the shell; an extra amount of pearly matter is thus secreted and forms roughnesses or projections on the inside of the shell, which, if becoming free and regularly spherical, form one or more pearls. Recent authorities state that pearls are also due to the presence of distomæ. It has been noticed that when the pearl oyster (Meleagrina) is large, well formed, and with ample space for individual development, pearls scarcely occur at all, but when the shells are crowded together, and become humped and distorted, as well as affording cover for all kinds of marine worms and parasitic creatures, then pearls are sure to be found (Cooke). The pearl-oyster fishery is carried on in the Aru Islands, the Sulu Archipelago, the Philippine Islands, Burma, the Persian Gulf, the Red Sea, at Ceylon, along the coasts of North Queensland, Northeastern Australia, and of West Australia, at New Guinea, and at the Pearl Islands on the Bay of Panama. This species also occurs along the coast of Lower California, and in the South Pacific in the Paumota, Gambier, and Navigator Islands, and also at Madagascar. The shell is very large, about eight to ten and even fifteen inches in diameter, while the valves are very thick and heavy, and in young individuals the outer surface is very rough and corrugated. The largest pearl known is said to measure two inches long, four inches round, and to weigh 1800 grains.

The 'mother-of-pearl' is the internal nacre or nacreous lamina of this oyster. It is utilized in the manufacture of buttons, studs, knife-handles, fans, card-cases, brooches, boxes, and all kinds of inlaid work.

Pearls may be formed in almost any bivalve, and some of the most valuable are taken from the shells of fresh-water mussels, but these are usually small and called 'seed-pearls;' they also occur in tolerable abundance in the common mussel of our coast (*Mytilus edulis*), very fair specimens at times being found; also in oysters, in *Placuna placenta* of the Pacific, in many species of Pinna,

and in the giant clam (Tridacna). Pearls are sometimes formed in univalve shells; thus pink pearls have been taken from the giant conch-shell (*Strombus gigas*) of the West Indies, as well as from certain species of Turbinella.

Pearl Fisheries. The average annual value of the pearl fishery of Northern Australia is $296,000, the industry having been founded at Thursday Island. It appears that the profits of the fishery are made out of the pearl shell only, because so many pearls, and often very valuable ones, are stolen by divers. Saville Kent distinguishes two species of pearl shells; viz. the large white shell (*Meleagrina margaritifera*) and a smaller black-edged form which he names *Meleagrina nigro-marginata*. Kent has proved that it is possible to transplant living pearl oysters. Under favorable conditions the shell is supposed to attain in three years the marketable size of eight or nine inches in diameter, while in five years a pair of shells may weigh five or six pounds, the extreme weight being ten pounds. The centre for labor and supplies of the Queensland fishery is Singapore, this port being an excellent market for the shells, while more pearls probably change hands here than in any other place in the world, large quantities being purchased for the Chinese market, where there is an extensive demand for second-class pearls.

The pearl oysters live at depths of from eight to twenty or more fathoms. For collecting the oysters small vessels of from 12 to 15 tons are most convenient. Two or more such boats are usually accompanied by a larger vessel as a storeship. The best divers are Japanese; Filipinos are also good, and Malays are employed. The diver takes with him a netted bag made of rope. When the depth is from eight to fifteen fathoms the diver can work at the bottom for two or more hours, but at a greater depth he cannot remain on the bottom more than fifteen minutes. The shells usually live in strong currents and in narrow channels between groups of islands, where they lie on a hard bottom.

The pearl fishery of the Mississippi and its tributaries is of much greater importance than is generally known. During recent years a thousand persons have been engaged in this industry on the Mississippi River alone. In 1901 a single firm is stated to have bought from these fishermen $100,000 worth of pearls, besides the clam or mussel shells from which pearl buttons are made. It is said that the supply of pearls is not being exhausted, but that the demand has increased so rapidly in the last fifteen years as to treble prices. The centre of the industry is Muscatine, Iowa.

In the United States the fresh-water pearl industry dates back to 1857, when the 'Queen Pearl' was found in New Jersey. It was sold to the Empress Eugenie for $2500 and is said to be worth now four times that sum. Tennessee, Kentucky, and Wisconsin are the leading States in the pearl industry, and in the ten years succeeding 1889 it is said that more than $25,000 worth of pearls were collected in Wisconsin alone. So great has been the destruction of the mussels there that in many places they are nearly if not quite exterminated.

PEARL. A beautiful English poem belonging to the second half of the fourteenth century. It is a lament of a father for a lost child, symbolized by a pearl. The poet possessed a spotless pearl. One day as he was in an arbor it slipped from his hand down through the grass and the flowers into the earth. Wandering afterwards into the arbor in search of the lost gem, he fell asleep amid the flowers, and in vision saw his lost child by the shimmering cliffs of the new Jerusalem. The poem consists of 101 twelve-line stanzas. The dialect is West-Midland. That the poet lived in the West of England near the Welsh borders is all that is known of him. Consult *Pearl*, edited, with a modern English version, by Israel Gollancz (London, 1891).

PEARL ASH (so called on account of the color), or Potashes. Crude potassium carbonate obtained from wood ashes. The commercial product is made in Canada, as follows: Wood is burned in pits and the resulting ash spread on a stone floor, sprinkled with water, and worked till it is damp, frequently with the addition of a little lime. The damp ash is then placed in casks containing false bottoms, covered with straw and hot water poured over them. The liquid, which is drawn off from a plug hole at the bottom, is boiled down, and finds some use in this condition as a manure owing to the soluble potash that it contains. The crude pearl ash thus obtained may be purified by heating and then cooled, during which the sulphate and chloride, together with the insoluble matter, are separated out, while the clear supernatant liquid is drawn off and boiled down until it crystallizes. When sufficiently pure this product finds use in the manufacture of flint glass. Ordinary pearl ash is used principally, however, in the manufacture of soap.

PEARL HARBOR. An inlet on the south coast of Oahu, Hawaii, six miles west of Honolulu (Map: Hawaii, C 2). It consists of several land-locked basins with a narrow entrance inside of which there is a depth of 60 feet. Outside, however, a coral reef prevents the entrance of large vessels. In 1884 the United States obtained the right from the Hawaiian Government to establish here a coaling and repair station, and several surveys were made by the United States Government. The harbor, however, was not utilized, and the acquisition of the harbor of Honolulu in 1898 rendered its improvement unnecessary.

PEARLITE (so called on account of the pearly lustre). A glassy or once glassy rock which exhibits a ready separation by cracks into spherical or spheroidal forms. These so-called pearlitic cracks may arise from stresses set up during the cooling of the magma, or from differential expansion and contraction about spherulitic masses of feldspar.

PEARL MILLET. A cereal grain. See Guinea Corn.

PEARL OYSTER. A tropical bivalve (*Meleagrina margaritifera*) noted for producing precious pearls and mother-of-pearl. See Pearl.

PEARL RIVER. A river of Mississippi. It rises in Winston County in the east central part of the State, and flows southward, emptying into the Mississippi Sound after having formed for some distance the boundary between Mississippi and Louisiana (Map: Mississippi, F 8). It is about 300 miles long, but its navigation is impeded by shoals and sand bars.

PEARL WEDDING. See WEDDING ANNIVERSARIES.

PEARL WOOD-NYMPH. See WOOD-NYMPH.

PEARSE, pērs, MARK GUY (1842—). An English clergyman and author. He was born in Camborne, studied medicine and then theology, and in 1863 entered the Wesleyan ministry. After holding various charges in Leeds, Ipswich, Bristol, Westminster, and elsewhere, on the motion of Hugh Price Hughes in 1889 he was chosen to take charge of the West London Mission, from which he retired after twelve years of service. His writings, numbering more than 25 volumes, include devotional works and semi-religious tales, especially of Cornish life. The best known are: *Daniel Quorm and His Religious Notions* (1874-79), of which hundreds of thousands have been printed in many languages; *Elijah, the Man of God* (1891); *The Gentleness of Jesus* (1898); *The Story of a Roman Soldier* (1899); and *West Country Songs* (1902).

PEARSON, pēr'son, CHARLES HENRY (1830-94). An English educator and historian, born at Islington. He studied at King's College, London, and at Oxford, receiving a B.A. in 1853 and an M.A. in 1856. He was appointed professor of modern history in King's College; but in 1871 he went to Australia, where he soon resumed teaching and became Minister of Education in Victoria. In 1892 ill health compelled him to return to England. His principal works are: *Russia, by a Recent Traveler* (London, 1859); *History of England During the Early and Middle Ages* (2 vols., London, 1867); *English History in the Fourteenth Century* (London, 1876); *Historical Maps of England During the First Thirteen Centuries, With Explanatory Essays, etc.* (London, 1869); *National Life and Character: A Forecast* (London, 1893); *Report on the State of Public Education in Victoria* (Melbourne, 1878); *Reviews and Critical Essays*, ed. by Strong (London, 1896). Consult Stebbing, *Charles Henry Pearson* (London, 1900).

PEARSON, JOHN (1613-86). An English prelate of high celebrity. He was born on February 28 at Great Snoring, in Norfolk. He was educated at Eton and King's College, Cambridge, where he took the degree of M.A. in 1639, and in the same year took orders, and was collated to a prebend in Salisbury Cathedral. In 1640 he was appointed chaplain to Sir John Finch, Lord Keeper of the Great Seal, and on the outbreak of the Civil War became chaplain to Lord Goring, and afterwards to Sir Robert Coke, in London. In 1654 he was appointed minister of Saint Clement's, Eastcheap, London; and in 1659 published the great work by which he is now remembered, *An Exposition of the Creed* (new ed., 2 vols., 1890-91). During the same year Pearson published *The Golden Remains of the Ever Memorable Mr. John Hales of Eton*. At the Restoration honors and emoluments were lavishly showered upon him. Before the close of 1660 he received the rectory of Saint Christopher's, in London; was created D.D. at Cambridge; installed Prebendary of Ely and Archdeacon of Surrey; and made master of Jesus College, Cambridge. In 1661 he obtained the Margaret professorship of divinity, and was one of the most prominent commissioners in the Savoy Conference; in 1662 he was made master of Trinity, Cambridge, and in 1673 was consecrated Bishop of Chester. In 1672 he published his *Vindiciæ Epistolarum S. Ignatii*, in answer to Daillé, who had denied the genuineness of the Epistles. In 1684 appeared his *Annales Cyprianici*. He died at Chester, July 16, 1686. Pearson's *Opera Posthuma Chronologica* were published by Dodwell (London, 1688, 3 parts), and his *Orationes, Conciones et Determinationes Theologicæ* contain much valuable matter. Consult Churton's memoir prefixed to Pearson's *Minor Theological Works* (2 vols., Oxford, 1844).

PEARSON, JOHN LOUGHBOROUGH (1817-97). An English architect, born in Brussels. He studied under Bonomi in Durham, and in London with Salvin and Hardwick; entered practice for himself in 1843; and built churches in Yorkshire (1843-46). A second period, following the construction of Trinity for Bentinck (1850), was largely devoted to restorations and especially to regroining old churches. In 1870 Pearson was employed in extensive repairs to the cathedral at Lincoln, and in 1879, having received a gold medal and the cross of the Legion of Honor at Paris in the previous year, he was intrusted with the plans for the new cathedral at Truro, which, completed in 1887, may be reckoned his greatest opportunity, and his best work. His most widely known work of restoration was that of the north transept of Westminster Abbey. Besides, he made important repairs at Canterbury, Rochester, Peterborough, Chichester, Bristol, and Exeter. For the most part his architectural type was ecclesiastical and Gothic, but he essayed some country houses and office buildings and at times used the Tudor, Jacobean, or Free Renaissance.

PEARSON, KARL (1857—). An English mathematician and author. He was educated at King's College, Cambridge, studied at Heidelberg and Berlin, and was called to the bar in 1882. After two years (1882-84) as professor of geometry, in 1885 he was appointed to a chair of applied mathematics and mechanics in University College, London. Pearson received the Darwin medal from the Royal Society in 1898. He wrote: *History of the Theory of Elasticity and Strength of Materials* (1886-93); *The Ethic of Freethought* (1888; revised 1901); *The Grammar of Science* (1892 and 1899); and *The Chances of Death, and Other Studies in Evolution* (1897).

PEA'RY, ROBERT EDWIN (1856—). An American Arctic explorer and civil engineer in the United States Navy, born at Cresson, Pa., May 6, 1856. He was graduated from Bowdoin College, Maine, in 1877, became a civil engineer in the navy in 1881, and in 1884-85, under Government orders, he was assistant engineer on the route of the proposed Nicaragua Ship Canal. In 1887-88 he was engineer-in-chief of the Nicaragua Canal survey. He had made a reconnaissance in 1886 of the Greenland inland ice-cap east of Disco Bay, in latitude 70° N. From this time until he sailed in 1891 on his first expedition to Northwest Greenland all his leisure was given to the most minute studies and preparations for his participation in Arctic research. During his first expedition (June, 1891-September, 1892) he made a brilliant record of achievements, not the least of which were the results of his studies and minute experimentation in the field cover-

ing every phase of the equipment for Arctic work. His journey over the inland ice, from 5000 to 8000 feet above the sea, from McCormick Bay to the northeast angle of Greenland (Independence Bay, latitude 81° 37′ N.), a round trip of 1300 miles including land travel on the northeast coast, was one of the most brilliant feats of polar sledge work ever accomplished. He proved that the northern extension of the great interior ice-cap ends below latitude 82° N. He also established the insularity of Greenland and ascertained the existence of detached ice-free land masses north of the mainland and the fact that the east and west coasts rapidly converge north of the seventy-eighth parallel. His ethnological work among the Eskimos known as the Arctic Highlanders (from Cape York to Smith Sound) was the most thorough and noteworthy that has been done in that region. The auxiliary expeditions in which well-known men of science participated gave opportunity for fruitful researches as to glacial and other Arctic phenomena. In 1893-95 he made another voyage to the same region, completed his study of the Arctic Highlanders, made another journey across the ice-cap to Independence Bay, and discovered the famous meteorites of the Eskimos near the coast of Melville Bay. They were later removed to New York, and one of them, weighing 90 tons, is the largest known to exist. After summer voyages to the Melville Bay regions in 1896 and 1897, he started north again in 1898 for the purpose of outlining the northern extension of the land masses above Greenland and of reaching the North Pole, if possible. His work covered four years, during which he made resurveys of a considerable extent of coast line in the neighborhood of Smith Sound, surveyed new coast lines on the west side of Grinnell Land and north of the Greenland mainland, and made a number of notable and very difficult sledge journeys along the northern channels leading to Lincoln Sea. Passing Lockwood's Farthest, he traced the northern limit of the land masses north of Greenland to its highest point, 83° 39′ N., and then followed the southerly trend of the coast for many miles toward Independence Bay on the east coast.

In the spring of 1902 he started over the frozen Arctic Ocean from Cape Heela, on the north coast of Grant Land, in his attempt to reach the North Pole. Each day's march was very arduous on account of the broken condition of the ice and the vast pressure ridges crossing his path. His general course was deflected to the west by the character of the ice. At his farthest camp in latitude 84° 17′ N. the polar pack became impracticable and further efforts to advance were given up. He had attained the nearest approach to the pole in the American Arctic. Commander Peary was elected president of the American Geographical Society in December, 1902.

PEARY LAND. A name given to the northern coast region of Greenland, which was first explored by Peary in 1892.

PEASANT WAR (OF. *paissant*, Fr. *paysan*, from OF. *pais*, *pays*, Fr. *pays*, country, from Lat. *pagus*, district, province, from *pangere*, to fix, to fasten; connected with *pax*, peace, Gk. πηγνύναι, *pēgnynai*, to fasten; and perhaps with Goth., OHG. *fahan*, AS. *fon*, Ger. *fangen*, to seize, take). The name given to the insurrection of the peasantry in Central and South Germany in the year 1524-25. With the decline of the feudal system the lot of the peasantry throughout Germany had greatly deteriorated. They were still subject to the oppressive exactions of their feudal masters, but the ancient service of protection from master to man had gradually disappeared. The example of Switzerland encouraged the German peasants to hope that the yoke of the nobility might be thrown off, and after 1475 there were risings here and there among the peasants of South Germany. A peasant league, called from its cognizance, a peasant's clog, the *Bundschuh*, rose in the Rhine countries in 1502, and another, called the 'League of Poor Conrad,' was organized in Württemberg in 1514; but both were put down. The great insurrection finally broke out in Swabia in June, 1524. Many of the secular nobility at first regarded the insurrection with some measure of complacency, because it was directed primarily against the ecclesiastical lords. An irregular warfare ensued, attended by the most revolting cruelty on both sides. In spite of the disadvantage under which the ignorant and poorly organized peasants labored, the insurrection spread through Alsace and the Palatinate, Franconia, Bavaria, Tyrol and Carinthia. The rising of the peasants was accompanied by insurrections among the lower classes in many cities. The movement in many parts took on a religious character, and was merged with the agitation of the Anabaptists (q.v.), Thomas Münzer (q.v.) becoming one of the principal leaders of the peasantry. The demands of the peasants were set forth in a manifesto issued about Easter, 1525, by the insurgents of Swabia, known as the Twelve Articles. These embraced the free election of their parish clergy; the appropriation of the tithes of grain, after competent maintenance of the parish clergy, to the support of the poor and to purposes of general utility; the abolition of serfdom, and of the exclusive hunting and fishing rights of the nobles; the restoration to the community of forests, fields, and meadows, which the secular and ecclesiastical lords had appropriated to themselves; release from arbitrary augmentation and multiplication of services, duties, and rents; the equal administration of justice; and the abolition of some of the most odious exactions of the clergy. The conduct of the insurgents was not, however, in accordance with the moderation of their demands. Their many separate bands destroyed convents and castles, murdered, pillaged, and were guilty of the greatest excesses, partly in revenge for the cruelties practiced against them. A number of princes and knights were forced to make common cause with them and even to join their ranks, the most noted of these being Götz von Berlichingen (q.v.). Luther denounced the excesses of the peasants, and called upon the princes of Germany to stamp out the insurrection. The peasant army in Central Germany, under the command of Münzer, was overwhelmed at Frankenhausen, on May 15, 1525, by the Landgrave Philip the Magnanimous of Hesse, at the head of the forces of Hesse, Saxony, and Brunswick. By June disorderly bands in South Germany had been mostly annihilated or dispersed. The peasants, after they had been subjugated, were everywhere treated with terrible cruelty. Multitudes were hanged in the streets, and many were

[illegible] the greatest tortures. Weinsberg, Heilbronn, Würzburg, and other towns that had forced them suffered the vengeance of the victors, and torrents of blood were shed. It is supposed that more than 100,000 persons lost their lives in the Peasant War. Flourishing and populous districts were desolated. The lot of the defeated insurgents became harder than ever, and many burdens of the peasantry originated at this period. Consult: Fries, *Geschichte des Bauernkriegs in Ostfranken* (Würzburg, 1884); Cornelius, *Studien zur Geschichte des Bauernkriegs* (Munich, 1862); Schreiber, *Der deutsche Bauernkrieg* (1864); Zimmermann, *Allgemeine Geschichte des grossen Bauernkriegs* (new ed., Stuttgart, 1891); Baumann, *Die zwölf Artikel* (Kempten, 1896); Janssen, *Geschichte des deutschen Volks seit dem Mittelalter* (Freiburg, 1877-94).

PEASE, Ernest Mondell (1859—). An American Latinist, born at West Union, Iowa. He graduated from the University of Colorado in 1882, and was fellow at Johns Hopkins University from 1884-86. He was instructor in Latin at Smith College 1885-86, professor of Latin at Bowdoin College, 1886-91, and at Leland Stanford Junior University, 1891-1902. With Prof. H. T. Peck, of Columbia University, he is editor of the *Students' Series of Latin Classics*, published in Boston. He is also the author of various philological papers and reviews.

PEAS'LEE, Edmund Randolph (1814-78). An American physician, known as an obstetrician and gynecologist. He was born in New Hampshire, and graduated from Dartmouth College in 1836, where he remained for two years as tutor. After taking his medical degree at Yale, he began practice in Hanover, N. H., in 1841. In 1842 he became professor of anatomy and physiology at Dartmouth. He was made professor of physiology and pathology in the New York Medical College in 1851, and in 1858 he assumed the chair of obstetrics and removed to New York City. This college became extinct in 1864. In 1874 he was made professor of gynecology in Bellevue Hospital Medical College. He published *Human Histology* (1857), and *Ovarian Tumors and Ovariotomy* (1872).

PEAT (possibly a variant of *beat*, sod, from *beet*, AS. *bētan*, to mend, from *bot*, Goth. *bōta*; OHG. *buoza*, Ger. *Busse*, reparation). The product resulting from the partial decay of vegetable matter—mosses and other marsh plants—which grows and dies in boggy places where water stands. The remains of the plants are often so well preserved that the species can be easily distinguished. Reeds, rushes, and other aquatic plants may usually be traced in peat, and stems of heath are often abundant in it; but it chiefly consists, in the northern parts of the world, of various species of Sphagnum (q.v.), or bog-moss. The plants are so well preserved in many bogs that attempts have been made with some success to utilize the fiber prepared from peat as a textile. Peat passes by insensible degrees into lignite (q.v.). The less perfectly decomposed peat is generally brown; that which is more perfectly decomposed is often nearly black. Moist peat possesses a decided antiseptic property which may be due to tannin, organic acids, or iron, and other salts present. This property is manifested not only in the perfect preservation of ancient trees and of leaves, fruits, etc., but sometimes even of animal bodies. For this reason peat is not well suited for use as a fertilizer in the raw state, but should be allowed to weather before being so used. In warm regions the decay of vegetable substances is, as a rule, too rapid to permit the formation of peat. But in the colder parts of the world the deposits are very extensive. In the Southern Hemisphere no moss seems to enter into their composition, and South American peat is said by Darwin to be formed of many plants, but chiefly of Astelia pumila, a phanerogamous plant of the rush family. The rate of growth is variously estimated at from two to four inches a year. Many thousands of acres are known in the North German lowlands; in Ireland estimates place the lowland bog area at 1,576,000 acres and the highland at 1,254,000 acres. Russia is said to have 6700 square miles of peat. Several million acres occur in Norway and Sweden, France and Holland. The United States and Canada have also extensive tracts, but only in the latter country have attempts been made to utilize them. For the physical characters, and the mode of reclaiming and converting peat bogs into arable land, see Bog.

Mere peat is not a good soil, even when sufficiently drained, but requires the application of lime, marl, etc., and other soil amendments to convert it into good soil. Peat bogs even when well drained are not at first productive. The peat must undergo a certain amount of decomposition to supply the nitrogen required by plants, and usually certain of the mineral constituents necessary to plant growth are deficient. Barnyard manure is frequently beneficial, probably because it not only furnishes a certain amount of available fertilizing matter, but promotes fermentation of the peat and thus renders its inert nitrogen available. Lime, marl, wood ashes, etc., are also used with benefit on peat bogs, for similar reasons and because they correct acidity and promote nitrification. Peat was formerly extensively used as a fertilizer, particularly in the form of compost (q.v.), but its use has declined since the general introduction of the more convenient and efficient commercial fertilizers. (See Manures and Manuring.) Dried peat is an excellent absorbent and is used to a considerable extent as a litter in stables. It has also been used in the manufacture of the so-called 'peat molasses,' a cattle food prepared by mixing the crude molasses from sugar factories with dried ground peat.

Peat is extensively used for fuel. The more perfectly it is decomposed, and therefore the more consolidated it is, the better. It is the ordinary fuel of the greater part of Ireland, where it is usually called turf, although the term turf in its ordinary English sense is utterly inapplicable to it. To procure peat for fuel, the portion of bog to be operated upon must first be partially dried by a wide open drain; its surface is then pared off with the spade, to the depth of about six inches, to remove the coarse undecomposed vegetable matter; the peat is afterwards cut out in pieces (peats) like bricks, by means chiefly of a narrow, sharp spade, the blade of which is furnished on one side with a tongue set at a right angle to it. The soft peats are set up on end in little clusters to dry. When sufficiently dry they are piled in out-houses or stacked in the open air. The operation of peat-cutting is al-

ways performed in spring or summer. Where peat for fuel cannot be obtained in the way just described, the black mud of a semi-fluid bog is sometimes worked by the feet of men, women, and children until it acquires such a consistency that it can be molded by the hand. The process is laborious, but the fuel obtained is good.

Peat is a light and bulky kind of fuel, and cannot be conveyed to considerable distances without too great expense. Efforts have, however, been made, both in Scotland and Ireland, to render it more generally useful, and so to promote the reclaiming of bogs by compressing it until its specific gravity is nearly equal to that of coal. For this purpose it is first reduced to a pulp. The compressing of peat has not been advantageously prosecuted on an extensive scale.

Peat-charcoal, made from uncompressed peat, is very light and inflammable, and therefore unsuitable for many purposes, but is well adapted for others, particularly for use as an antiseptic and deodorizer. Peat-charcoal is highly esteemed for the smelting of iron, and for working and tempering the finer kinds of cutlery. Charcoal made from compressed peat is in density superior to wood-charcoal, and is capable of being used as coke. Various attempts have been made to obtain valuable products from the destructive distillation of peat, but without profitable results. Kane states that 1000 parts of peat yield about 11 of sulphate of ammonia. For further information, consult: Storer, *Agriculture* (New York, 1897); Koller, *Die Torf Industrie* (Leipzig, 1898); Bach, "Peat," *The Mineral Industry*, vol. vii. (New York, 1899); Ries, "Peat," *Mineral Resources, in United States Geological Survey Reports for 1901* (Washington, 1902); Page, "Making Coal of Bog Peat," in *Iron Age*, vol. lxii. (New York, 1898); Johnson, *Peat and Muck* (Hartford, 1859). See COAL. See Plate of MOSSES AND LICHENS, with the article MUSCI, for illustration of peat moss.

PEAT BOG. See SWAMP.

PEA TREE. See PEPPER TREE.

PEAUCELLIER'S CELL. See LINKAGES.

PEAU DE CHAGRIN, pō dē shā'grăn' (Fr., Asses' Skin). A tale by Balzac (1831), in which the author incorporates portions of his own experiences and philosophy. The central idea is the conflict between the ideal and the material. The hero, Raphaël, is the possessor of a piece of ass's skin having the magic power of fulfilling material wishes, but diminishing in size each time the power is exercised, and associated with a corresponding shortening of the possessor's life. After a reckless use of its properties, Raphaël tries to refrain from wishing, but is overcome by the material side of his nature and perishes. The work exhibits Balzac's power of giving reality to the fantastic and unnatural.

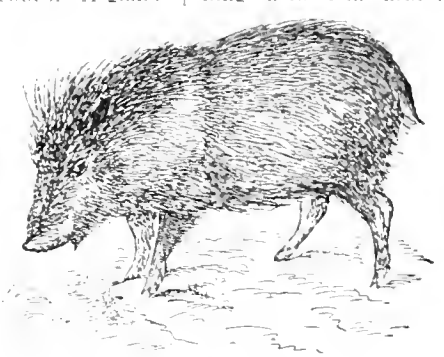
PE'BA (South American Indian name). A small armadillo (q.v.). In Texas and Mexico the name is given to the nine-banded armadillo (*Tatusia novemcincta*), which is about 30 inches long, and is notable as the only edentate that occurs in the United States. In South America the name is sometimes given to armadillos of the genus of Dasypus.

PEBRINE. A disease of silkworms. See SILKWORM.

PECAN (probably from the North American Indian name), *Hicoria pecan*. The common name of an American forest tree 75 to 170 feet high, and its fruit—a nut. (For the botany of the pecan and its forestry value, see HICKORY.) The tree is native to river bottoms from Iowa and Kentucky southwest into Texas and Mexico, but is now grown commercially in a number of other Southern States and in California. It has not proved commercially successful north of parallel 40°.

The trees grow on nearly all soils, but for nut production a sandy loam soil with a clay subsoil has proved most satisfactory in the Southern States. The trees should be set about 40 feet apart. Clean orchard cultivation should be practiced. Through cultivation and selection a number of varieties have been originated, which, since they do not come true to seed, are budded or grafted upon seedling stocks. Little pruning, except the removal of dead limbs, is required after the head has been formed. The trees come into bearing in five or six years, but paying crops cannot be expected under ten years, and full crops not under twenty. Mature trees sometimes yield as high as twenty bushels of nuts each, but two to three bushels per tree is probably a good average. The nuts have a rounded oblong shape and vary in weight from 25 to 100 to the pound. The varieties called paper shells are considered most desirable, because their shells are very thin and are easily cracked between the fingers. The meats are large and separate easily from the shell. At the present time Texas and Louisiana furnish the bulk of the commercial nuts, mostly from native trees.

PECCARY (probably from the South American Indian name). A small wild hog of the warmer parts of America, two species of which, of the genus Dicotyles, represent the swine (Suidæ) in the New World, or, in the view of some, constitute a separate family Dicotylidæ. They differ from typical swine in having a mere tubercle instead of a tail; no external toe on the hind feet; and the tusks short and not curved outward. A gland opening on the loins near the



THE COLLARED PECCARY.

tail secretes a fetid humor, and must be cut out at once after killing a peccary, or the flesh will be tainted. The common collared peccary or tajaeu (*Dicotyles torquatus*) is found in almost all parts of South America and north through Mexico to Texas and Arkansas; the white-lipped peccary (*Dicotyles labiatus*) lives in Guiana, Brazil, Paraguay, and Peru. Both species are gregarious, the white-lipped often assembling in very large herds, and sometimes doing great mischief to maize and other crops,

... attacked at night, when the animals do ... feeding. The common peccary chiefly ... forests, and small companies sometimes take up their abode in the hollow of a great tree. It is about the size of a small hog, grayish, bristly, and maned. A narrow white collar encircles the neck. The white-lipped peccary is considerably larger, of a darker color, with conspicuously white lips. Both species are capable of being tamed, but are of irritable and uncertain temper. In a wild state they defend themselves vigorously against assailants, making good use of their sharp tusks, a whole herd combining for defense. Their most dreaded enemy is the jaguar, or in the north the puma, which seizes one when it can be caught alone, but hurries into a tree to escape the onslaught of a herd. Human hunters have less to fear from them, judging by the Texas examples, than old stories would indicate. They are omnivorous, and, if hurtful to crops, render service by destroying reptiles. Their voice is somewhat like that of the hog, but more sharp. Their flesh is inferior to domestic pork. Consult: Alston, *Biologia Americana Centrali: Mammals* (London, 1879); Audubon and Bachman, *Quadrupeds of North America* (New York, 1841).

PE-CHI-LI, or **PE-CHIH-LI**, pā'chē'lē'. An old name for the province of China which is now known as Chi-li, which means 'Direct Rule,' and is so called because it is the one in which is situated the Imperial capital (Map: China, E 3). The name Pe-chi-li is in frequent use by foreigners outside of China and on maps, but is not used by the Chinese themselves.

Chi-li is the most northerly of the six maritime provinces of China proper. It is bounded on the north by inner Mongolia, on the west by Shan-si, on the south by Ho-nan and Shan-tung, on the northeast by a small portion of Liao-tung, and on the east by the Gulf of Pe-chi-li. It now includes within its jurisdiction a portion of inner Mongolia lying north of the Great Wall, where many Chinese have settled. Area, 59,949 square miles, nearly half of which lies beyond the wall.

With the exception of a number of scattered ridges of moderate height in its western and northern parts, the entire province is a plain formed by delta deposits. It is well watered by the Pei-ho (q.v.) with its numerous tributaries and their many feeders, and by the Lan-ho, which rises in Mongolia, and, like the Pei-ho, flows into the Gulf of Pe-chi-li. It is also traversed from southwest to northeast by the Yun-liang-ho or Grand Canal, which terminates at Tien-tsin. There are three lakes in the centre of the province, and several lagoons elsewhere. The province is rich in minerals, especially in coal, which has long been worked by the natives, and is now mined by modern methods at Kai-ping (q.v.). Iron is also plentiful, and silver has been found in several places. In the hills are great quarries of granite, marble, white saccharoid, and blue limestone. Except along the shores, where there are alkaline exudations, the soil is fertile and produces good crops of wheat, barley, millet, maize, cotton, tobacco, indigo, etc. The production of rice is not great; it is grown chiefly in the vicinity of the lakes. The climate is extreme, the temperature ranging from 8° F. below zero in winter to 95°, 100°, and at times 108° F. in summer. The rivers are frozen over from the middle of November to about the end of March. The shores are very low and the coast waters shallow. The chief outlet for commerce is the Pei-ho, and Tien-tsin was the only treaty port until December 15, 1901, when the port of Chin-wang-tao, near the end of the Great Wall (which had been seized by the foreign admirals operating against the Boxers in 1900, and improved by them), was thrown open to foreign trade. This has a wooden pier 2000 feet long, at which vessels drawing 16 feet can unload. The roads are very poor, but railways have been introduced and under foreign competition are extending rapidly.

For administrative purposes Chi-li is divided into 11 fu or departments, 6 chi-li-chow or subdepartments, each subdivided into a certain number of prefectures, with the rank of *ting*, *chow*, or *hien* (or *hsien*). At the head of the Government is a Governor-General, a Governor, and the usual corps of provincial officials, all of whom reside at the capital, Pao-ting-fu (q.v.). Since the opening of Tien-tsin to foreigners, however, the Governor-General finds it convenient to spend most of his time there. Of the 11 fu, one called Shun-t'ien-fu is detached from the jurisdiction of the provincial Government. Its chief city, Shun-t'ien-fu, is the seat of the National or Imperial capital, and is best known as Peking. The officer who rules the department of Shun-t'ien-fu resides here. The population of the province is estimated at 18,000,000 to 20,000,000.

PECHT, pĕkt, Friedrich (1814—). A German painter, illustrator, and art-critic, born at Constance. He was at first occupied for some years as a lithographer in Munich, then went to Paris in 1839 to study painting under Delaroche, and subsequently worked in Munich, Dresden, Leipzig, Frankfort, and London on portrait and genre pictures. A sojourn in Italy (1851-54) was devoted chiefly to art-historical studies, the results of which he embodied in *Südfrüchte. Skizzenbuch eines Malers* (1854). Settled in Munich, he became favorably known through a series of scenes from the lives of Goethe and Schiller, but more especially through his illustrations for the *Schiller-Galerie* (1855-59), *Goethe-Galerie* (1861-62), *Lessing-Galerie* (1866-68), and *Shakespeare-Galerie* (1870-76). For these publications he also supplied the text. In fresco he executed in a hall of the Maximilianeum at Munich twelve portraits of generals and statesmen (1868-71), and in the council chamber at Constance "Episodes from the History of the City" (1869-77, in collaboration with Fr. Schwörer). His publications include: *Deutsche Künstler des neunzehnten Jahrhunderts* (1877-85); *Geschichte der Münchener Kunst im neunzehnten Jahrhundert* (1886-87); and *Aus meiner Zeit, Lebenserinnerungen* (1894); and he edited *Die Kunst für Alle* (Munich, 1885 et seq.).

PECK (perhaps from *peck*, *pick*, AS. *pycan*, Icel. *pikka*, to pick, prick). A measure of capacity for dry goods, such as grain, fruit, etc., used in America, and equivalent to two imperial gallons, or 554.54 + cubic inches. It is thus the fourth part of a bushel (q.v.). See Weights and Measures.

PECK, George (1797-1876). A Methodist minister. He was born at Middlefield, N. Y.; joined the Genesee Conference of the Methodist Episcopal Church in 1816; was appointed presiding elder of the Susquehanna District in 1824; was principal of Cazenovia Seminary 1835-40, and in the last year was elected editor of the

Methodist Quarterly Review, which position he filled for eight years. In 1848 he was elected chief editor of the *Christian Advocate and Journal*, in New York, retaining the position for four years. He was pastor at Wilkesbarre, Scranton, Providence, and Dunmore; and his public labors included a period of sixty years. His published works are: *Universalism Examined* (1826); *Scripture Doctrine of Christian Perfection* (1841); *Rule of Faith* (1844); *Reply to Bascom on Slavery* (1845); *Christian Exertion* (1845); *Manly Character* (1852); *History of Wyoming* (1858); *Early Methodism Within the Bounds of the Old Genesee Conference* (1860); and *Our Country* (1865). Consult his autobiography (New York, 1874).

PECK, Harry Thurston (1856—). An American classical scholar, editor, and critic, born in Stamford, Conn. In 1881 he graduated at Columbia University, in which institution he was made successively instructor in Latin, and for a while in the Semitic languages, and in 1888 professor of Latin language and literature, after having spent some time in advanced study in Paris, Berlin, and Rome. In the line of his own researches, his publications include *The Semitic Theory of Creation* (1885); *Suetonius* (1889); *Latin Pronunciation* (1890); and he also edited *University Bulletin; A Dictionary of Classical Literature and Antiquities* (1895); *Classical Studies* (1895); *Roman Life in Latin Prose and Verse* (1895); *Trimalchio's Dinner* (1899); and a series of Latin classics for college use. In 1890 he became editor-in-chief of *The International Encyclopædia*, continuing as such until 1901, when, with President Gilman and Professor F. M. Colby, he edited *The New International Encyclopædia*. He was also the editor-in-chief of Appleton's *Atlas of Modern Geography* (1892) and of *Masterpieces of Literature* (1899). In 1895 he assumed the editorship of *The Bookman* when that magazine was established, and thereafter published the following works in general literature, besides a large number of special papers, monographs, and reviews: *The Personal Equation* (1897); *The Adventures of Mabel* (1897); *What is Good English?* (1899); and a volume of verse, *Graystone and Porphyry* (1900).

PECK, Jesse Truesdell (1811-83). A Methodist Episcopal bishop. He was born at Middlefield, Otsego County, N. Y.; studied at Cazenovia Seminary; joined the Oneida Conference in 1832; was principal of Gouverneur Wesleyan Seminary in 1837-41, and of the Troy Conference Academy at West Poultney, Vt., in 1841-48; president of Dickinson College in 1848-52; pastor of the Foundry Church in Washington, D. C., two years. In 1854 he was appointed secretary and editor of the Methodist Tract Society; he labored eight years in California as pastor and presiding elder. Returning to the East, he was pastor in Peekskill, Albany, and Syracuse, and in 1872 was elected bishop. He was one of the founders of Syracuse University. He published: *The Central Idea of Christianity* (1855); *The True Woman* (1857); *The History of the Great Republic Considered from a Christian Standpoint* (1868).

PECK, John James (1821-78). An American soldier, born at Manlius, N. Y. He graduated at West Point in 1843, and was assigned to the Second Artillery, with which he served both in the Southern and the Northern campaigns during the war with Mexico, winning by his gallantry the brevets of captain and major. In 1853 he resigned from the service and became treasurer of a projected railroad from New York to Syracuse and cashier of the Burnet Bank in Syracuse. He was a delegate to the Democratic national convention at Charleston in 1860. At the outbreak of the Civil War he accepted a commission as brigadier-general of volunteers in the Federal service. In 1862 he took part in the Peninsular campaign, and after the battle of Malvern Hill (July 1, 1862) commanded the infantry of the rear guard. On July 4th he was promoted to be major-general, and after the withdrawal of the main army from the Peninsula commanded the troops left to hold the strategic position at Suffolk (September, 1862-May, 1863). There he was attacked by Generals Longstreet and D. H. Hill with a superior force, but managed to hold his own until General Hooker's movements before Fredericksburg caused the Confederate Government to send its forces north. He was mustered out of the service on August 24, 1865, and in 1867 he organized the New York Life Insurance Company at Syracuse, of which he was president until his death.

PECK, Samuel Minturn (1854—). An American poet, born in Tuscaloosa, Ala. He was educated at the University of Alabama and in New York. His poems are collected under the titles: *Cap and Bells* (1886); *Rings and Love-Knots* (1893); *Rhymes and Roses* (1895); and *Fair Women of To-day* (1895). His best known song is "The Grapevine Swing."

PECK, Tracy (1838—). An American Latinist, born at Bristol, Conn. He graduated from Yale in 1861 and continued his studies at the universities of Berlin and Bonn, Germany. From 1871 to 1880 he was professor of Latin at Cornell University. Since the latter date he has held a similar position in Yale College. In 1898-99 he was director of the American School of Classical Studies at Rome. His publications include papers read before the American Philological Association, and an edition with Professor Greenough of *Livy*, books xxi. and xxii. (Boston, 1893). With Prof. C. L. Smith he is editor-in-chief of the *College Series of Latin Authors*.

PECK, William Guy (1820-92). An American soldier and mathematician, born at Litchfield, Conn. He graduated at West Point in 1844, and was assigned to the corps of topographical engineers. In 1845 he accompanied Frémont's third exploring expedition through the Rocky Mountains, and during the war with Mexico served under General Kearny in the Army of the West. In 1847 he was appointed assistant professor of mathematics at the Military Academy, but in 1855 he resigned from the army and became professor of physics and engineering at the University of Michigan. In 1857 he accepted the position of adjunct professor of mathematics and astronomy at Columbia, and in 1861 he was promoted to the chair of mathematics, mechanics, and astronomy. He published a number of excellent elementary text-books on mathematics, and was joint editor with Prof. Charles Davies of the *Mathematical Dictionary and Cyclopædia of Mathematical Science* (1855).

PECKHAM, pĕk'ăm, Rufus William (1838—). An American jurist, born in Albany, N. Y.

He was educated at the Albany Academy and in Philadelphia. He was admitted to the bar in 1859, and in the following year succeeded his father, Rufus Wheeler, as law partner to Lyman Tremain. As district attorney of Albany County, Peckham served for three years. He was counsel to the Albany and Susquehanna Railroad in its famous suit against the Erie Railroad; and in 1881 was successful in the national bank tax cases before the Supreme Court. At the same time he had entered politics and was a representative to the Democratic national conventions of 1876 and 1880. He became corporation counsel of the city of Albany in 1881; was justice of the New York State Supreme Court (1883-86); and, during his term as justice of the State Court of Appeals in 1895, was appointed associate justice of the United States Supreme Court.

PECKHAM, Wheeler Hazard (1833—). An American lawyer, son of Rufus Wheeler Peckham, born in Albany and educated at Union College. He studied law in the office of Peckham and Tremain, practiced in New York City with his father, then in Saint Paul until 1862, and in 1864 again in New York. His growing fame as a constitutional lawyer and his argument on the constitutionality of taxing greenbacks won him the friendship of his opponent in this case, Charles O'Conor, who as Deputy-Attorney-General during the exposure of the Tweed ring made Peckham his assistant. In 1884 he was appointed district attorney of New York City, but soon returned to law practice in the firm of Miller, Peckham & Dixon. In January, 1894, President Cleveland nominated him for the Supreme Court, at a time when he was president of the State Bar Association. But the nomination was not confirmed by the Senate, because of the opposition of the New York Senators to Mr. Peckham's anti-machine Democracy. In 1896 he took a firm stand in favor of sound money.

PECKSNIFF. A character in Dickens's *Martin Chuzzlewit*, a pompous hypocrite and fraud, who pretended to carry on a school for architects, but really plundered and abused his pupils. His daughters were Merry and Cherry, one of whom married Jonas Chuzzlewit, while the other was the victim of unrequited love.

PE'COCK, Reginald (c.1395-c.1460). A British Bishop of the Roman Catholic Church, born in Wales. He was educated at Oxford, and was ordained a priest in 1421. Ten years afterwards he was master of Whittington College, London, and he was appointed rector of Saint Michael's, in Riola, Bishop of Saint Asaph's (1444), and of Chichester in 1450. He took an aggressive part in the controversy with the Lollards, who were striving to abolish certain rites of the Church of which he approved, and published an introduction to the Christian faith in dialogue form, entitled *Donet* (c.1440), and *Repressor of Over Much Blaming of the Clergy* (c.1455). In his *Book of Faith* (c.1456, partially printed in 1688), he argued against the infallibility of the Church, and in later works went so far as to deny the authenticity of the Apostles' Creed and to place reason above authority. For these and other heresies, forerunners of modern toleration, he was called to account before Henry VI. and his lords at Westminster (1457) and was given the choice between the stake and recantation. He chose the latter, his fourteen books were burned, and he ended his days in a cell of Thorney Abbey, Cambridgeshire.

PECOS, pā'kŏs. The principal tributary of the Rio Grande. It rises at the foot of Baldy Peak, near Santa Fé, in north-central New Mexico, and flows first southeast, then southward along the western escarpment of the Llano Estacado, turning again southeast in Texas, and emptying into the Rio Grande 36 miles northwest of Del Rio, Texas, after a course of 800 miles (Map: Texas, C 4). In its upper course it flows through a cañon-like valley, and it receives nearly all its tributaries from the west. Near Carlsbad, N. M., storage reservoirs have been constructed for irrigation purposes.

PECQUET, pe'kâ'. Jean (1627-74). A French anatomist, born at Dieppe. He studied medicine at Montpellier, where he soon made the important discovery of the course of the lacteal vessels, including the *receptaculum chyli*, or reservoir of Pecquet, as it is sometimes called, and the termination of the principal lacteal vessel, the thoracic duct, into the left subclavian vein. His principal works are: *Experimenta Nova Anatomica* (Paris, 1651; Amsterdam, 1661; trans. into Eng., London, 1653); *De Circulatione Sanguinis et Chyli Motu*, and *De Thoracicis Lactcis* (1654).

PÉCS, pāch. The native name of a royal free town of Hungary. See Fünfkirchen.

PECTASE (from Gk. *πηκτικός, pēktikos*, congealing, from *πηγνύναι, pēgnynai*, to solidify). An enzyme (q.v.), widely distributed in plants, attacking certain of the constituents of the cell wall. The formation of vegetable jellies from ripe fruits is mainly dependent upon the action of this enzyme. The substances it decomposes may be termed in general pectins. Their composition and relationships are not thoroughly understood, though they are undoubtedly allied to the carbohydrates, especially to cellulose. In the presence of minute quantities of pectase and of a calcium salt in solution, the pectins are decomposed and form pectose and calcium pectate, which gelatinize promptly. Pectase, therefore, is to be reckoned as one of the clotting enzymes. When fruits are boiled and the juice is expressed and allowed to cool it sets into a jelly; because the pectase and pectins extracted therefrom react, and in the presence of the calcium salts, always found normally in plants, set into a jelly, entangling the other dissolved and suspended materials present.

PECTEN. See Scallop.

PECTORAL SANDPIPER (Lat. *pectoralis*, relating to the breast, from *pectus*, breast). A well-known migratory sandpiper (*Tringa maculata*) of North America, called 'grass-snipe,' 'jack-snipe,' and 'meadow-snipe' by gunners. It owes its booknamc to an extraordinary ability on the part of the male to puff out its throat (œsophagus) after the manner of a pouter pigeon. (The act is depicted on the Colored Plate of Shore Birds.) It was first noticed by Edward Adams (*Proceedings Zoölogical Society of London*, 1859), and afterwards confirmed, described, and figured by Nelson, Murdoch, and others in their works on the natural history of Alaska (cited under Alaska), where it has its summer home. This performance is a part of its courtship, not only as an attention to the female, but

as a menace to rivals. (Compare RUFF.) During its migratory visits to the United States it is a favorite with sportsmen, because of its game-like manner of lying well in the grass before a dog, and its crooked, snipe-like flight. Moreover, its flesh is exceedingly palatable.

PECTORILOQUY (from Lat. *pectus*, breast + *loqui*, to speak). The term applied to a distinct transmission of articulate voice-sounds when the ear or stethoscope of the listener is placed upon the chest wall. This phenomenon was discovered and named by Laennec (q.v.). In the normal chest the voice sound is transmitted through the lung substance of the patient to the ear of the listener only as a distant, muffled sound, known as *vocal resonance*. Over the bronchi this vocal resonance is increased, the voice sounds become nearer and louder. When there is an approach to articulate speech, this is called *bronchophony*, and occurs also over portions of lung tissue which have become solidified by disease. In pectoriloquy, however, the voice is not only louder and plainer, but words and even syllables are perceived with startling distinctness. The pathological conditions under which this occurs are either a consolidation of the lung substance connecting a large bronchus with the chest wall, which consolidation acts as an unusually perfect conductor of the vocal vibrations; the presence of a cavity in the lung having free communication with a bronchus, in which case the sound is conveyed by air; a pneumothorax having open connection with a bronchus; or, more rarely, compression of the lung by an extensive pleuritic effusion. (See PLEURISY.) As a rule pectoriloquy is interpreted to mean the existence of a cavity in the lung with a thin layer of solidified tissue between it and the chest wall.

Whispering pectoriloquy is produced, under the same conditions mentioned above, when the patient whispers instead of talking. It is a curiously distinct reproduction of the whispered words, and is a test of much delicacy and exactness.

PEDAGOGY, pĕd'ă-gō'jĭ, or **PEDAGOGICS** (from Gk. *παιδαγωγία*, *paidagōgia*, training of children, from *παιδαγωγός*, *paidagōgos*, trainer of children, from *παῖς*, *pais*, child + *ἀγωγός*, *agōgos*, leader, from *ἄγειν*, *agein*, to lead). The science of education; a body of facts and principles bearing on the aims and methods of effectively equipping the young for life—aiding them in attaining their spiritual majority, and fitting them for their vocation. It is still in its infancy; comparatively few of the problems pertaining to education either in the home or at school are as yet solved by applying established principles in a scientific manner. Numerous and complex, these problems can be worked out only by the help of the sciences of psychology, physiology, ethics, sociology, and anthropology, and in the light of the spirit of the time, the ideals of the nation, and existing local conditions. Any solution of them, indeed, is impossible, except through the coöperation of the various institutions that make up society: the home, the school, the Church, the diverse vocations, and the State in its several functions. That the present time is marked by progress toward more efficient coöperation between these factors is gratifying.

While there are certain fixed factors in education, and certain principles of universal application, the greater part of the educational field is characterized by adjustment and change. With the growth of cities, home life is revolutionized; inventions and discoveries make possible and necessary the introduction of new subjects, and the changing of old ones; foreign-born children require a somewhat different curriculum from that of native-born children, city children from country children; in a commercial centre, a high school of commerce is a necessity; an industrial community calls for industrial schools; the children of a farming district should have opportunity to study the elements of agriculture; schools of forestry are the natural preventive of the denudation of forest lands; in an age of pressing economic problems, it is an anomalous condition that the study of economics should be postponed till the college course. The study of Latin clearly cannot hold the same place in the twentieth century that it held in the sixteenth or even the nineteenth.

The expansion of modern knowledge and the complexity of modern life are reflected in the modern crowded curriculum, and in the problems to which it gives rise. In a 'three-R' elementary curriculum, or in a college course consisting largely of Greek, Latin, and mathematics, the choice of studies was only an academic question; with a multitude of subjects to choose from, the question of educational values becomes vital. This question has been asked and answered in various ways. With Herbert Spencer it took the form: What knowledge is of most worth? Spencer's answer was, Science, by which he meant the scientific habit of mind in mastering those subjects which bear on man's efficiency in society, including, primarily, the natural sciences and history, with literature and art subsidiary to these. Nicholas Murray Butler, in an essay bearing the same title, assigns the highest place to those subjects that afford in the highest degree nurture and exercise to man's spiritual nature, and in this judgment modern educators generally agree with him. Attacking this same problem at closer quarters, Commissioner William T. Harris asks the question, What groups of subjects are essential to a complete education? and gives this answer: There are six coördinate groups of studies: (1) Mathematics and physics, which give us the command of nature quantitatively; (2) biological science, which gives us the key to the organic phase of nature; (3) literature and art, which reveal human nature in its intrinsic form, and show man in his relation to social institutions; (4) grammar and language, and studies allied with them, such as logic and psychology, which enable the mind to know itself analytically; (5) history, or the study of the development of the State and its relations to the individual; (6) religion, which looks at human experience and knowledge in their relation to God. An education which should not provide at least the elements of each group would be incomplete.

The question still remains, Upon what principles shall studies be chosen within these groups? A favorite way of approaching this question has been to classify all subjects (1) as giving discipline to the faculties of the mind; (2) as giving practical training for life; (3) as giving culture. Thus, bookkeeping and spelling are valued chiefly for their practical value; algebra

and grammar for their disciplinary value; literature and art for their power to give that sympathy, appreciation, and insight into the meaning of life which we call culture. But it is clear that no subject is without some value in each of these departments. And, further, it appears that much depends on the method of teaching, the purpose in view, and individual attributes; the same study may serve now as a bread-and-butter subject, now as a culture subject, according to circumstances. The same study may train memory or reason, according to the method employed; or the same study may be good for one pupil, and not so good for another. Moreover, with the fall of the faculty theory in psychology, the dogma of formal discipline has been discredited. It is held that there is no such thing as training 'the memory,' and that to transfer skill acquired in one department to another department is not in any strict sense possible. It follows that, in any given case, considerations of environment, aptitude, aim in life, and method must have greater weight in determining the choice of studies than values assigned to studies in the abstract. These considerations furnish justification from one point of view for the expansion of the modern curriculum and the concomitant development of the elective system.

At what point shall studies be introduced? This question is to be answered partly in the light of the capacity of the child, and partly in the light of the culture-epoch theory, which assumes that the child in his development passes through a series of stages corresponding closely to the epochs through which the race has passed in its progress from primitive to modern culture. Gen. Francis A. Walker, after investigating the study of arithmetic in the elementary school, protested against 'prying up' the powers of the child by giving him tasks for which he was not yet ready, and which he could in due time perform naturally and easily. On similar grounds, it has been proposed to decrease the amount of reading and writing called for in the first three years of school; but advocates of this plan seem not to give sufficient weight to the fact that children in these very years show a decided tendency to perform these activities, and a marked ability to master them. It is clear that to postpone the study of mythology and of mediæval history until the child has passed the culture epoch to which they appeal involves waste. The application of this latter principle, however, is made difficult by the fact that the youngest child is a member of the modern world as well as of the primitive world—that he can and must learn about the arrangements for heating and lighting his own house as well as about back-logs and tallow candles.

Children in the elementary school sometimes carry as many as fifteen so-called 'subjects' at one time: how shall they be kept from being overwhelmed by the multiplicity of subjects and interests? Certain well-established principles throw light on the solution of this problem. First, the doctrine of apperception, which asserts that the mind acquires knowledge by means of knowledge already possessed—that what we can learn is conditioned absolutely by what we have to learn with. Secondly, the principle of self-activity, which affirms that the child is not primarily a knowing being, but an active being, whose instincts and impulses start him on the way to knowledge, and whose practical needs teach him to think. Empirical observation attests the truth of these principles; it has been conclusively shown, for example, that under the old régime children learned the little they had to learn with greater difficulty and strain than they accomplish their greatly increased tasks, if only the work be properly organized and conducted.

In order to understand the various attempts at *correlation*, it is necessary to consider the evolution of the idea. The revolt against the isolation of studies was the outgrowth of Herbartian doctrines. According to Herbart, 'erziehender Unterricht'—instruction that educates, or education through instruction—expresses the aim and the chief means of formal school work. Now, education means moral character-building, and character is produced by the training and culture of volition—the will being reached only through the emotions, these in turn depending on ideas. But not from ideas in any form and relation do emotional warmth ('interest') and volitional energy spring, but only from those ideas that are knit into a living whole. Hence the fundamental significance in the Herbartian pedagogy of the phrase *'circle of thought,'* by which it is meant that instruction should be both many-sided and closely connected; and hence the capital rôle played in the same system by *interest*—interest being that condition of mind of which the cause is knowledge made real and vital through being related, and of which the effect is volition. The early schemes of correlation were produced in Germany and were characteristically formal, treating correlation as chiefly a question of curriculum, and so perhaps better described as schemes for the *coördination* of studies. Usually, however, German plans of coördination took the form of *concentration*, whereby certain studies were made dominant and others were treated as subsidiary to them. There was no agreement as to what studies should be the core, some choosing literature and history, others natural sciences. In America, under the impulse of Herbartian ideas, much fruitful experimenting has been done, at first after the German manner (taking *Robinson Crusoe*, for example, as the central subject of a year's work and 'relating' arithmetic, geography, reading, drawing, manual training, and other studies to this core), and later in ways independently American. For the most part, this latter work may be described as *informal correlation*. For example, a part of the work of a year or a part of the year in a certain grade may cluster around the reading of *Hiawatha* and the making and decorating of various objects illustrative of the story, no attempt, however, being made to confine the work in arithmetic, geography, and nature-study within the limits of Hiawatha's life. Even where correlation is not recognized in the curriculum there is an increased tendency to recognize the manifold inter-relations which exist between all subjects and parts of subjects. In support of such partial schemes it is claimed (1) that variety and difference are as essential to wholesale mental development as are identity and relatedness; (2) that the child studies with intense interest and with assimilation so apparently isolated a study as arithmetic; (3) that a correlating teacher can make an apperceptive child even without a correlated curriculum. But there can be no doubt that waste is

often avoided by studying at the same time subjects related both to each other and to the theoretical and practical interests of the child.

The most important single contribution to this subject made by American educators is the monograph *Interest as Related to Will*, by Prof. John Dewey, in which interest is represented as arising when the child does that which makes for self-expression (self-realization). This view not only places interest in its proper subordinate place, but also makes it clear that a curriculum is not to be worked out in the closet, and that character-building does not necessarily result when the child is occupied with apparently interrelated studies. In the practical working out of this principle, the child, with his manifold impulses to act, his interests, his social relationships, his spiritual environment and heritage, becomes the core of correlation, and those creative social activities that have to do with providing food, clothing, shelter, and æsthetic expression become the gateway both to knowledge and to character. The influence of this insight into the dynamic nature of education (whereby 'educative activity' is substituted for 'educative instruction') has been and is destined to be profound and far-reaching.

In an ideal system of education, the pupil would pass without loss of time or energy from the kindergarten into the elementary school, thence into the high school, college, and professional school. Between the kindergarten and the elementary school, on the one hand, and the college and the professional school on the other, the transition is now, indeed, measurably natural and easy. But the transition from elementary school to high school and from high school to college involves considerable waste, which it is being attempted to obviate through conference, discussion, and experiment.

The foundation principles of education may for the present purpose be summarized in the form of an answer to the question, Wherein does the so-called 'new education' differ from that system which it has replaced or is replacing? Ever since the rise of democratic institutions, there has been developing a new conception of the worth of the individual; and during the past fifty years this conception of the individual has been modified and reinforced by a new conception of society. It is now coming to be vividly realized that the ideal of individual development is realized in the highest social efficiency, and that the ideal social or institutional development demands individuals that have attained perfect self-realization. This insight has been reflected in educational aims and methods. In the old education, based on a certain lack of faith in the individual and on contempt for the body and this present world, the characteristic notes were authority, intolerance, and disregard of hygienic laws; the mainstay in teaching was naturally memorizing. The new education is based on respect and even reverence for humanity —on belief in the worth of the present moment, and on the doctrine of evolution. Its dominant features are, therefore, appeal to individual observation, experience, judgment, reason—enrichment of school programmes; and enlightened consciousness of the differences in individuals, and a consequent tolerance and adaptation. Under the impulse of these conceptions school hygiene is recognized as an important adjunct to pedagogics; psychology, instead of dealing only with traits supposed to be common to all, is investigating those peculiar to types and even to individuals; child study makes careful studies of actual children at various stages of development in order to determine effective ways of dealing with each type at each stage. As for educating the child to be a social being, the new education proceeds by regarding and treating him as a social being from the start. The most advanced schools of all grades are those which recognize most fully the possibilities of social training latent in the class, the school, the playground. Constructive work, especially the form known as group work (where all the members of the class are engaged on a common project, each contributing his share) is a fine illustration of how a subject can contribute to both individual and social development. Mention has already been made of the recognition of the need of adjusting the child to his social environment through the curriculum. The bearing of these ideas on *moral education* is obvious. Morality is to be attained in the individual as such only through his own free and responsible choosing to obey law; it is best to be attained in the individual considered as a social unit by living morally in the society of which he is a member—the family, the school, the neighborhood.

The main objection urged against the new education is that it fails to provide for training that power to "endure hardness as a good soldier" which is the bone and sinew of character; that in suiting school work to the grain of a child's disposition it fails to prepare for those demands of life which go against the grain. It is a sufficient answer to this objection to say: (1) that bone and sinew are none the less firm, and they are the more useful, when developed by growth rather than inserted ready-made; and (2) there is no virtue or strength either in school or in life to be gained by overcoming difficulties merely by a dead pull; the secret of power in performing difficult tasks is the ability to raise any task above the level of drudgery into relation with life as a whole. By giving this power, the new education greatly multiplies the ability to overcome obstacles.

Educational Methods. The word 'method' is used in two senses: (1) to designate those special rules which are applicable to the teaching of a particular subject; and (2) to designate general modes of procedure applicable to all subjects. Examples of the first are the various methods of teaching reading, as the phonetic method, the sentence method, the word method, etc. Each of these methods can be defended on psychological grounds, yet each is incomplete. The most effective method is that which combines the good points of all methods into one. The final test of a method is not, "Can arguments be made in its favor?" but "Will it work?"

Under the head of 'general method' belongs the doctrine of the *formal steps of instruction*. This doctrine is based on the assumption that the mind must follow a certain order of processes in grasping any subject presented to it: there must be *preparation* of the ideas already in the mind, *presentation* of the new facts, *comparison*, *abstraction*, *generalization*, whereby the meaning of the facts is arrived at and stated in terms; and, finally, *application*, whereby the knowledge thus gained is translated into life. The essential value

of this doctrine lies not so much in its assumption of an unchanging time order of processes, as in its emphasis of the fact that there are certain processes which are essential to a complete act of instruction.

Using 'general method' in the sense of a law of teaching applicable to any subject, the following maxims may serve as examples: (1) In all teaching, whether in instruction or in training, let spirit be uppermost, and mechanism subordinate to it. This is the first and great commandment; upon it are based a multitude of specific directions: such as, thought first, form second; interest first, then criticism; praise first, if possible, and let blame be simply the subtracting from a fund of praise; let the teacher's first aim be to lead the pupil to love a subject, and afterwards he may do what he will; seize the moment of excited curiosity that it may not run to waste—an impulse of the human spirit is a power which the teacher cannot produce at will, but which, unfortunately, he can cramp and suppress; on the other hand, the teacher should make mechanism his ally, not his enemy. 'Drive thy habits, let them not drive thee.' (2) A second general principle may be stated thus: We learn most effectively by our own activity under the spur of a practical interest. We learn least effectively when we are least active and least interested. A teacher who applies this principle will multiply opportunities whereby his pupils may learn by experience, by discovery, by executing; by object lessons, laboratory and shop work and the relations of school life; whereby they may apply what they have heard or read or gained in any second-hand way, thus supplying, though in the reverse order, the element reality. (3) A third general principle of teaching may be described as learning by thinking. The teacher who follows this leads his pupils to avoid being swamped by details, because, grasping together many particulars into a convenient bundle duly tagged, he will form in them the habit of foresight and forethought, and he will develop in them the power to search out meanings and to find the essential point of a problem, a situation, or an argument.

In deciding the order to be followed in teaching the topics in a subject, two conflicting systems have held sway. The first arranges the topics of the subjects in logical order, ignoring the fact that what is first in experience is last in thought, that the psychological order is usually the reverse of logical order. The second arranges the topics with reference to the child's supposed needs; either (1) teaching related processes concurrently (as in the Grube method in arithmetic) and carrying a number of topics abreast, returning to each at more or less regular intervals with increased power, as in the *spiral method*, or (2) determining the order of topics rather by the need of the child than by the strict development of the subject; for example, introducing the subject of osmosis at the point when the children are eager to understand how the root of a plant receives nourishment from the earth.

By the *inductive method* of teaching, a pupil is led from facts to generalizations; for example, in natural science where individual forms are first observed, then classified according to essential characteristics; and in the study of syntax, where the rule is formulated after several cases of the construction are observed and compared.

By the *deductive method*, the teacher or the author first states a principle and then proceeds to elucidate and exemplify it, as when in grammar the definition of noun is given and then examples of nouns. Each of these methods has its own field, every subject having its deductive and its inductive stage, and every study of any subject being partly deductive and partly inductive. In the *Socratic method*, the teacher asks questions designed to lead the pupil to think about what he already knows, to see his mistakes, revise his judgments, and discover the truth. This method is especially applicable in subjects involving moral or æsthetic judgments, where the pupil has experiences and knowledge more or less unorganized. Akin to this is the *method of discovery*, which leads the pupil to experiment, observe, infer, and formulate conclusions. In all the above methods the principle of self-activity and participation is called in. Often combined with these is the *method of discussion*, in which the teacher proposes, or has members of the class propose, theses to be defended. The advantages and dangers of this method are extreme. Great skill and address, together with the power of summarizing the discussion, are required in the leader. All these methods aim to make the pupils ready, resourceful, self-reliant. They need to be supplemented by some form of the *lecture method* or by the *text-book method*, which are strong on the side of exactness and breadth. The *recitation* (which is the name applied in the United States to class exercises in general) varies in efficiency according to the method pursued. The minimum of advantage results if the time be spent in saying lessons learned memoriter from a book, or in reciting facts more or less known to all the class. A class exercise is at its best when the class is engaged upon some problem toward the solution of which each one, including the teacher, from his peculiar point of view, contributes his proper share. It has been proposed that instead of recitations in which the quick and the slow proceed at the same rate, each pupil should be allowed to go at his own pace under the guidance of the teacher. This plan (known as the *Pueblo plan*), though it contains an element of wisdom, is of only limited application. Its vital defect lies in its failure to recognize sufficiently the social value of the recitation.

BIBLIOGRAPHY. Adams, *Herbartian Psychology* (Boston, 1898); Butler, *The Meaning of Education* (new ed., New York, 1902); Eliot, *Educational Reform* (ib., 1878); Froebel, *Education of Man* (ib., 1887); Blow, *Symbolic Education* (ib., 1894); Dewey, *The School and Society* (Chicago, 1899); Hall, in *Pedagogical Seminary, passim* (Worcester, 1891); Herbart, *Science of Education* (London, 1892); Hanus, *Educational Aims and Educational Values* (New York, 1899); Harris, *Psychologic Foundations of Education* (ib., 1899); James, *Talks to Teachers* (ib., 1899); Laurie, *Institutes of Education* (ib., 1892); Bishop Potter, *Principles of Religious Education* (ib., 1900); Rosenkranz, *Philosophy of Education* (ib., 1886); Spencer, *Education* (ib., 1861).

PEDAL (Lat. *pedalis*, relating to the foot, from *pes*, foot). Any part of a musical instrument acted on by the feet. The pianoforte, the harp, and the organ are furnished with pedals, which, however, serve an entirely different purpose in each instrument. In the pianoforte their object is to effect a change in the quality or in-

tensity of the sound: the damper pedal prolongs the sound after the finger is lifted from the key, and the shifting or *una corda* pedal softens the tone. The pedals of the harp are the means by which the chromatic changes of intonation are effected. In the organ the pedals are keys put in action by the feet. The division of the organ which is connected with the foot-keys is called the pedal organ, and contains the largest pipes. The introduction of pedals in the organ has been attributed to various men, among them a German of the name of Bernhard, who lived in the fifteenth century. Pedals known as *combination pedals* are also used in the organ by which certain fixed combinations of stops may be utilized. Recent improvements in organ-building have made possible the choice of such combinations by the performer, who before commencing to play arranges the combinations he wishes to use, to act on the swell and on the stops. See ORGAN.

PEDAL-POINT. See ORGAN-POINT.

PEDDLER. A person who travels from place to place selling at retail goods, wares, and merchandise, which he carries about with him. Peddlers are to be distinguished from ordinary traveling salesmen, who sell goods by sample and have a recognized headquarters from which the goods are shipped. Because of the irresponsible character of most peddlers and the difficulty of tracing fraud or other crime to them, statutes have been enacted in almost all of the United States requiring them to take out licenses and to conform to certain other regulations, such as wearing a badge or shield, bearing their license number, where it can be easily seen. See LICENSE.

PEDEE', GREAT. A river in South Carolina. See GREAT PEDEE RIVER.

PEDESTAL (It. *piedestallo*, base of a pillar, from *piede*, from Lat. *pes*, foot + *stallo*, from OHG. *stal*, Ger. *Stall*, stall). A base for columns, statues, vases, etc. The pedestal is much used in classic (especially Roman) architecture. Like the column, it has a base, a body or central block, and a capital or cornice, usually called the surbase. The shaft or plain block is called the dado or die.

PEDIC'ULA'RIS (Lat., lousy). A genus of more than 100 herbs of the natural order Scrophulariaceæ, some of which have rather large and finely colored flowers. Several species have been called lousewort, the English equivalent of Pedicularis, from their supposed influence in producing the louse disease in sheep. Their acridity seems to make them injurious as sheep food. Many species are found in Continental Europe and Northern Asia, and some in North America. A few species are cultivated chiefly for their finely cut beautiful foliage. *Pedicularis Canadensis*, wood betony, is the most common species in the United States.

PEDIC'ULA'TI (Neo-Lat. nom. pl., from Lat. *pediculus*, little foot, diminutive of *pes*, foot). An order of marine fishes having the carpal bones elongated into a kind of arm which supports the broad pectoral fin, and the anterior dorsal fin reduced to a few tentacle-like, mostly isolated, spines; the anglers (q.v.), frog-fishes, etc. See Plate of ANGLERS AND BATFISH.

PEDIGREE (of uncertain etymology; perhaps from OF. *pied de grue*, crane's foot, in allusion to the resemblance of the lines of a pedigree to a bird's foot). Family relationship traced back through a number of degrees or generations, sometimes including the record of births, marriages, and deaths. The term is most frequently employed in the law in connection with a rule of evidence which forms one of the exceptions to the so-called 'hearsay rule' of evidence, and may be generally stated to be, that statements as to the pedigree of the party in question made by a blood relative of that party, as a brother, since deceased, may be repeated by a witness who heard them made. See AFFINITY; CONSANGUINITY; EVIDENCE; KIN, NEXT OF.

PEDIMENT (Lat. *pedamentum*, prop for a vine, from *pedare*, to furnish with feet, from *pes*, foot). The triangular space over the colonnade at the ends of the roof of classic buildings. It is inclosed by the horizontal and the raking cornices, the latter following the slopes of the roof and corresponding to the cornice of the entablature. The pediment may be called the gable of classic buildings. In Greek temples the pediment was frequently enriched with sculpture, for which it forms a fine setting. The finest examples are the pedimental sculptures of the temples of Ægina, Olympia, and the Parthenon at Athens. The doors and windows of buildings of the Renaissance are often surmounted by pediments, either straight-sided or curved, and the form was also used in mediæval structures for façades and minor architectural parts. In such cases the terms to use are more properly gable (q.v.) and fronton.

PEDOMETER (from Lat. *pes*, foot + Gk. *μέτρον metron*, measure). An instrument resembling a watch and used for measuring distances traveled by walking. Such an instrument usually records on a dial plate the number of steps taken by the person carrying it.

PEDRARIAS DÁVILA, pā'drā-rē'ās dā'vē-lā (*c.*1440–1530). A Spanish administrator in America, born in Segovia, Spain. Pedro Arias de Avila was his proper name, but historians have contracted it. He distinguished himself in the conquest of Granada, and he served in the New World as governor of the Spanish colonies on the Isthmus of Panama in 1514. He found a rival there in Balboa, whom he finally executed (1517). This deed put Pedrarias out of favor with the Spanish Court, but the emissaries sent to dislodge him failed in their mission, and he continued governor, founded Panama (1519), and extended his sovereignty by settling colonies to the north and south. But he was jealous of any one else attempting the same, hindered Pizarro as much as he could, and had Córdoba beheaded for trying to league himself with Hernando Cortés at Honduras. For these and other tyrannical acts Pedrarias was called upon to exchange the governorship of Panama for that of Nicaragua, where he died.

PEDREGAL Y CANEDO, pā'drā-gäl' ē kā-nā'thō, MANUEL (1832–96). A Spanish politician and author, born at Grado. He studied law, and took a prominent part in politics as an ardent Republican. After the abdication of Amadeus, in 1873, and during the period of the Republic, Pedregal was twice Minister of Justice, and once Minister of Finance. The following year he

reformed to private life and devoted himself to study, and to the foundation of the Institución Libre de Enseñaza, of which he was made rector in 1883. He reëntered politics in 1882 as Deputy from Oviedo, and with Azcárate, Salmeron, Labra, and others, organized the Republican party called 'centralista,' which has stood for the best element in radical politics. His works include *El poder y la libertad en el mundo antiguo* (1878); *Estudios sobre el engrandecimiento y la decadencia de España* (1878); *Elección presidencial de los Estados-Unidos* (1892); *Nociones de hacienda pública* (1881); and *Sociedades cooperativas* (1888).

PEDRELL, pā-drĕl'y', Felipe (1841—). A Spanish writer on music. He was born at Tortosa, studied music, and in his earlier period composed considerably. His works include the operas *El último Abencerraje* (1874), for which he wrote music and book, *Quasimodo* (1875), and *El Tasso en Ferrara* (1881), and the lyric dramas *Cleopatra*, *Mazeppa*, and (1894) *Los Pirineos*, as well as songs and masses. In all these works there is originality and an evident effort to build up a national musical style. Of even more importance is Pedrell's works as a critic and historian of music. The two great works, *Hispaniæ Schola Musica Sacra* (1894 sqq.) and *Teatro lírico español anterior al siglo XIX* (1897 sqq.), are original and able. His lexicographical labors include *Diccionario técnico de la música* (1894) and a biographical dictionary of Spanish and Portuguese musicians (1897 sqq.).

PEDRO I., *Port. pron.* pā'drô (Dom Antonio Pedro de Alcantara Bourbon) (1798-1834). Emperor of Brazil. He was the second son of John VI., King of Portugal from 1816, and was born at Lisbon, October 12, 1798. In 1807 the royal family fled to Brazil before the invading armies of France. There John VI., on the death of his mother, Maria I., was crowned King of Portugal, and Dom Pedro, heir apparent since the death of his elder brother (1801), attained much influence in politics in spite of his youth and his rather irregular education. In 1821 King John returned to Portugal and Dom Pedro was made Regent of Brazil. He soon threw in his lot with the Brazilian national party, who were disgusted by the systematic preference shown to the Portuguese in the appointment to high offices in Church and State. The separatist movement attained formidable proportions, and on October 12, 1822, Dom Pedro was proclaimed Emperor of Brazil. The slight resistance made by Portugal was easily overcome, and in 1825 the mother country acknowledged the independence of Brazil. The popularity of the Emperor, which was at first very great, was gradually weakened by the arbitrary measures taken against the Republican faction, and his acceptance of a new constitution in 1824 did not materially mend matters. In 1828 the Province of Uruguay succeeded in establishing its independence of Brazil. Opposition to the Government increased, and Pedro at length, April 7, 1831, abdicated in favor of his son, Pedro II., and went to Europe. He had been proclaimed King of Portugal upon the death of his father, in 1826, but had resigned the throne in favor of his daughter, Donna Maria da Gloria, who had been set aside by her uncle, Dom Pedro's younger brother, Miguel (q.v.). The ex-Emperor invaded Portugal in the early part of 1832 with an army largely made up of English and French volunteers, to make good his daughter's title to the throne. He occupied Oporto in July, and a year later made his entry into Lisbon after his admiral, Sir Charles Napier had vanquished the fleet of Dom Miguel off Cape Saint Vincent. The usurper was forced to abandon all claims to the throne in 1834. In August, 1834, Dom Pedro was chosen Regent of the Kingdom, but he died on September 24th of the same year, two days after the coronation of the young Queen, Donna Maria.

Armitage, *History of Brazil* (London, 1836), gives an excellent account of events during the residence of the Braganza family in Brazil.

PEDRO II. (?-1213). King of Aragon. A brave soldier and a gifted troubador. He succeeded his father, Alfonso II., in Aragon and Catalonia in 1196, and in France he secured the lordship of Montpellier. He was crowned at Rome in 1204, and promised to send a yearly tribute to the Papal chair. His efforts to impose a new tax on his people aroused opposition on the part of the nobility and the towns, and these formed a league against him. In 1212 he entered into an alliance with the kings of Castile and Navarre against the Almohades (q.v.), which resulted in the great victory of Las Navas de Tolosa on July 16. The next year he crossed into France to aid the Albigenses against Simon de Montfort (q.v.), and was killed at the battle of Muret, September 2, 1213.

PEDRO II. (Dom Pedro de Alcantara) (1825-91). Emperor of Brazil. He was the son of Emperor Pedro I. and was born at Rio de Janeiro, December 2, 1825. He was but five years old when his father abdicated in his favor, April 7, 1831. During his minority the country was governed by a regency. He was declared of age in 1840, was crowned in 1841, and married in 1843 Theresa Christina, sister of Ferdinand II. of the Two Sicilies. His sons died in childhood, and his daughter Isabella became heiress to the crown. The early years of the reign of Pedro II. were marked by revolutionary disturbances within the country and complications with the neighboring South American States. Revolts in the provinces of Sao Paulo and Minas Geraes were suppressed in 1842, as were similar insurrections in Rio Grande do Sul in 1845, and Pernambuco in 1849. In 1851 Brazil assisted General José de Urquiza, Governor of Entre-Rios, in his struggle against Rosas, the dictator of Buenos Ayres, and was instrumental in bringing about the fall of the dictator. A five years' struggle in conjunction with Uruguay and the Argentine Republic against Lopez, the dictator of Paraguay (1865-70), ended in the triumph of the allies. In 1867 Dom Pedro opened the Amazon to the commerce of all nations. In 1871 a law was passed for the gradual abolition of slavery, which was hurried to its completion by popular demonstrations in 1888. Dom Pedro's administration was conducted with tact and good judgment. On November 15, 1889, however, as a result of a revolution instigated by the officers of the Brazilian army, Dom Pedro was forced to abdicate and a republic was proclaimed. A pension was conferred on the ex-Emperor and he was sent to Europe on a Government vessel. Dom Pedro spent the remaining years of his life in France, and died in Paris, December 5, 1891. He was a man of wide culture, and Brazil made

great progress under his guidance. He traveled extensively, both in America and in Europe, and devoted much time to studying systems of government and education.

PEDRO THE CRUEL (1334-69). King of Castile and Leon from 1350 to 1369. He was the son of Alfonso XI. and Maria of Portugal, and was born at Burgos, August 30, 1334. On his father's death Pedro succeeded to the throne without opposition. He was greatly influenced by his mother, and Albuquerque, his favorite. His bastard brother, Henry of Trastamare (q.v.), plotted against him constantly. But the great opposition which he encountered was due to his marriage, in 1353, to Blanche of Bourbon, whom he abandoned after three days, and a second marriage in 1354 to Juana de Castro, whom he abandoned after two days. The friends of both joined his brothers. He was taken prisoner in 1354, but soon escaped and took cruel revenge. From 1357 to 1361 he was engaged in a war with Pedro IV. of Aragon. Henry of Trastamare, who had fled to France, returned (1366) at the head of a body of exiles, reinforced by Bertrand du Guesclin (q.v.) with an army of mercenaries, and aided by Aragon, France, and the Pope. Pedro prevailed upon Edward, the Black Prince, to espouse his cause. Edward invaded Castile in the spring of 1367, defeated Henry and Du Guesclin at Najera, and restored Pedro to the throne. But the King disgusted his chivalrous ally by his cruelty to the vanquished, and paid no heed to his remonstrances; Edward accordingly repassed the Pyrenees, and left the treacherous monarch to his fate. The whole kingdom groaned under his cruelties; rebellions broke out everywhere; and in August, 1369, Henry returned. Pedro's forces were routed at Montiel, and he himself was compelled to retire for safety within the town, whence he was treacherously decoyed and captured by Du Guesclin. He was carried to a tent, where a quarrel took place between him and Henry, in which the latter killed Pedro. Consult: Garcia, *Castilla y Leon durante los reinados de Pedro I., Enrique II., Juan II., Enrique III.*, vol. i. (Madrid, 1891); Burke, *A History of Spain*, vol. i. (London, 1895).

PEEBLESSHIRE, pē'b'l-shēr, or TWEEDDALE. A southeastern county of Scotland, bounded by Edinburgh on the north, Selkirk on the east, Dumfries and Selkirk on the south, and Lanarkshire on the west (Map: Scotland, E 4). Area, 355 square miles. The surface generally is mountainous, 450 feet above the level of the sea at the lowest point and attaining a maximum altitude of 2754 feet in Broadlaw. The principal river is the Tweed (whence Tweeddale) and its affluents. The arable lands are in the valleys, the highlands being chiefly pastoral. Cereals are largely grown and green crops. Coal is mined and there are deposits of ironstone and limestone. Woolens are manufactured. Capital, Peebles. Population of county, in 1891, 14,750; in 1901, 15,066. Consult Chambers, *A History of Peeblesshire* (Edinburgh, 1864).

PEEKSKILL. A village in Westchester County, N. Y., forty-one miles north of New York City; on the east bank of the Hudson River, just below the Highlands, and on the New York Central and Hudson River Railroad (Map: New York, G 4). It has several private secondary schools and the Field Library, with over 6800 volumes; Helping Hand Hospital, St. Joseph's Home, a House of the Good Shepherd, and the State Military Camp. There are extensive manufactures of stoves, fire brick, hats, underwear, foundry products, blank books, etc. The water works are owned and operated by the municipality. Peekskill was settled in 1764, and derives its name from Jans Peek, an early Dutch navigator. It was incorporated as a village in 1816 and was reincorporated in 1827. Near it is the famous Robinson House, the headquarters of Generals Putnam and Parsons in 1778-79, and of Arnold in the summer of 1780. It was here that Arnold first learned of the capture of André. Population, in 1890, 9676; in 1900, 10,358.

PEEL. A seaport town and a favorite watering resort on the west coast of the Isle of Man, England (Map: England, B 2). It was formerly called "Holm." Its fisheries are productive, and the building of vessels of small tonnage and the manufacture of nets are carried on extensively. At the northern extremity of the bay on which it stands are several grotesque and romantic caverns. The southern extremity is formed by Peel Island, which contains the grand old ruins of Peel Castle, described in Scott's *Peveril of the Peak*. The castle was formerly the frequent residence of the earls of Derby, then lords of the Isle of Man, and is expressly named in the original grant of Henry IV. to the Stanley family. It incloses a 'round tower' and the ruins of a cathedral, beneath which is a strong subterranean dungeon, where many notable persons were imprisoned. Population, 3600.

PEEL, PAUL (1860-92). A Canadian artist, born in London, Ontario. At the age of sixteen he went to the Pennsylvania Academy of Fine Arts in Philadelphia, and in 1880 to the Royal Academy, London, thence to Paris, where he studied with Gérôme, Boulange, and others. He was a pupil of Benjamin Constant for nearly five years and achieved great skill as a colorist, especially in flesh tints as shown in nude children. In 1889 he obtained an honorable mention at the Paris Salon for his painting "How Bitter Life Is," and the following year was awarded a gold medal for "After the Bath," which was acquired by the National Gallery at Budapest, Hungary. Queen Alexandra bought his "Two Friends" for Buckingham Palace, and "Fording the Stream" hangs in the City Hall, Toronto. His other pictures include "The Unwilling Model," "In Punishment," "The Unexpected Meeting," and "The Twins."

PEEL, Sir ROBERT (1788-1850). An eminent British statesman. He was born on February 5, 1788, the eldest son of Robert Peel (created a baronet in 1800), a wealthy cotton-spinner. Peel was educated at Harrow and Christ Church, Oxford, graduating from the latter in 1808. In 1809 he entered the House of Commons, where he began his career in supporting the Tory Ministry of the Duke of Portland. In 1810 he was appointed Under Secretary for War and the Colonies. In 1812, Lord Liverpool having meanwhile become Prime Minister, Peel became Chief Secretary for Ireland. In this capacity he had to consider three great questions: patronage, the preservation of order, and the maintenance of the Protestant ascendency. In order to carry out these affairs successfully, Peel ignored all personal ends, and appointed Catholics and Protestants alike,

thus strengthening his party. He created the Irish constabulary, dubbed 'Peelers,' and became involved in such a bitter contest with Daniel O'Connell (q.v.) that he was driven in 1815 to send the agitator a challenge. The police, however, prevented the duel from taking place. Peel remained Irish Secretary until 1818, when he resigned. He had been chosen in 1817 the representative of Oxford in Parliament, an unusual honor for so young a man. He also began about this time to acquire a reputation as a financier and economist; and in 1819 he was appointed chairman of a special committee to consider the state of the Bank of England. As a result the so-called 'Peel's Act' was adopted, according to which specie payments were resumed on May 1, 1823.

Peel had been a vigorous opponent of all acts intended to emancipate the Catholics, but about this time his views gradually began to change, though the process was so slow that after he had reëntered the Ministry in 1822 as Home Secretary he continued to oppose the measures of Canning, the most powerful advocate of the Catholics, and in 1827, after Canning had become Prime Minister, Peel resigned. In 1828 he again became Home Secretary in the Cabinet of the Duke of Wellington. By this time Peel decided to support Catholic emancipation, and on March 5, 1829, himself introduced a bill to effect this change, which soon became a law. As a result of this reversal of his views, Peel no longer remained the representative of Oxford. He also brought about at this time numerous reforms in the laws, and in 1829 established the London police force.

In November, 1830, the Cabinet was defeated, on the question of Parliamentary reform, and Peel for the first time belonged to the Opposition. He vigorously attacked the Reform Bills, and played an important part in the various dramatic episodes of that time. On December 9, 1834, he became Prime Minister, and tried to carry on the Government in the face of an overwhelming hostile majority, but on April 8, 1835, he was compelled to give up the contest. He began slowly, but surely, to build up the great Conservative Party, so called since 1831, and gathered together under his leadership young men like Disraeli and Gladstone. In 1839 the Conservative leader was summoned on one occasion to form a Cabinet, but Queen Victoria refused to submit to changes in the personnel of her household, and so the Whigs remained in power. They were, however, pressed on the one side by the new Radical Party and the Anti-Corn League, and on the other by O'Connell. They lost ground, and in 1841 were compelled to dissolve Parliament. The general election that ensued was virtually a contest between free trade and protection, and the latter won. When the new Parliament met, the Conservative Party, headed by Peel, came into office. The Whigs desired a fixed and moderate duty on foreign corn; the Anti-Corn League wished free corn; while Peel was in favor of a modification of the sliding scale of duty which had existed since 1828. He introduced and carried in 1842, in spite of strong opposition, a measure based upon this principle. The deficit in the revenue, which had become quite alarming under the Melbourne Administration, next engaged his attention, and led him to bring in a bill (1842) for the imposition of an 'income tax' of 7d. in the pound, to be levied for three years. To equalize still further the burdens of taxation, Peel commenced a revision of the general tariff, and either abolished or lowered the duties on several very important articles of commerce. The great Bank Charter Act of 1844 was the measure to which Peel himself felt most attached, and which he considered the most important and far-reaching of his Administration. He also showed himself resolute in the repression of the malcontents of Ireland. O'Connell (q.v.) was tried for conspiracy, and though the judgment against him was set aside on appeal to the House of Lords, the influence of the 'agitator' was broken. The first half of 1845 was marked by the increase of the allowance to Maynooth and its change into a permanent endowment instead of an annual grant, and by the foundation of the Irish nonsectarian colleges and other important measures. The potato-rot in Ireland during the autumn, followed by a frightful famine, rendered 'cheap corn' a necessity, if millions were not to starve. Cobden and the League redoubled their exertions. Lord John Russell announced the views of the Liberal Party on the crisis, and Peel finally yielded. He told his Ministerial colleagues that the corn-laws were doomed, and their repeal was inevitable. Some of them refusing to go along with him, he resigned; but after a few days he was recalled, and the repeal was carried. He was, however, immediately afterwards defeated on a protection of life bill for Ireland. Not so much upon this account, as because he felt that the course which he had pursued had produced a dissolution of the old ties of party, and that he could not expect for some time to find himself at the head of a strong Government, Peel retired from office in June, 1846, giving place to a Liberal Administration under Lord John Russell, to which he gave an independent but general support as the leader of a middle party rather than Liberal or Conservative. In the critical times of 1847-48 he was one of the most important props of the Government, whose free-trade principles he had now completely accepted. His ecclesiastical policy had also undergone a remarkable change, and he now frankly supported the Liberals in their efforts to carry an act for the repeal of the Jewish disabilities. On June 28, 1850, he spoke with great eloquence in the debate on Lord Palmerston's Greek policy. On the following day he was thrown from his horse in Hyde Park, and was so much injured that he died on the evening of July 2, 1850.

The best authorities for a study of Peel are: *Collection of Speeches Delivered in Parliament* (4 vols., London, 1853); Stanhope and Cardwell, *Memoirs by Peel* (ib., 1857); Hardinge and Peel, *Sir Robert Peel: His Life and His Private Correspondence* (ib., 1891). A great number of biographies of Peel exist. Among the best may be named: Taylor and Mackay, *Life and Times of Sir Robert Peel* (London, 1846-50); Doubleday, *The Political Life of Sir Robert Peel* (ib., 1856); Sir Lawrence Peel, *Life and Character of Sir Robert Peel* (ib., 1860); Guizot, *Sir Robert Peel: Etude d'histoire contemporaine* (ib., 1856). Consult also "Peel," in *Twelve English Statesmen Series*, in *Prime Ministers of Queen Victoria Series*, and in *Statesmen Series*.

PEELE, GEORGE (c.1558-c.1597). An English dramatist. He was educated at Christ's Hospital

School, where his father was a clerk, and at Christ Church, Oxford, graduating B.A. in 1577, and M.A. in 1579. On returning to London he was driven from the precincts of Christ's Hospital owing to his dissipated conduct. He seems to have been a skillful player as well as a playwright. His chief plays are the *Arraignment of Paris*, performed before the Queen probably in 1584; *Edward I.* (printed 1593), one of the earliest historical plays in English; *The Battle of Alcazar* (printed 1594); *The Old Wives' Tale* (printed 1595); and the richly Oriental *David and Bethsabe* (printed 1599). Though Peele's dramatic work has less importance than Greene's and Marlowe's, it yet helped prepare the way for Shakespeare. Peele wrote a couple of pageants, also, and among his miscellaneous writings are "An Eclogue Gratulatory," addressed to the "Renowned Shepherd of Albion's Arcadia, Robert, Earl of Essex," and "The Beginnings, Accidents, and End of the Fall of Troy," important because Shakespeare may have got from it the idea of treating fully the theme of Troilus and Cressida. Peele's style is often highly poetical. His verses are sweet, but his rhyme seems faulty. Many of the lyrics and pastorals scattered through his plays have great charm. Consult his *Works*, ed. by Bullen (London, 1888).

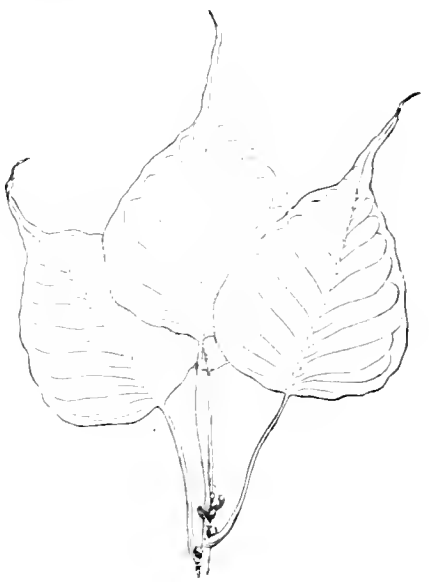
PEELE, John Thomas (1822—). An English-American genre painter, born in Peterborough, England. He came to the United States at an early age, and was self-taught. He began by painting portraits, but after 1846 took up genre painting, especially of juvenile subjects. He settled in England about 1851. His works include "The Children of Robert Thornton," and "Children of the Wood," bought by Prince Albert of England.

PEENE, pā'ne, Hippoliet Jan van (1811-64). A Flemish dramatist. He was born at Capryeke, in East Flanders, studied medicine at Louvain, and practiced in Ghent from 1837 to his death. Besides a popular song, *De Vlaamsche Leeuw*, for which the music was written by Karel Miry, Peene's work was for the stage. As early as 1835 he had written a French vaudeville, *La vieillesse de Stanislas*. His *Keizer Karel* (1847) is the first example in Flemish of the same genre. Of his later plays the more important are: *Brigitta* (1847), an opera; *Jan de Vierde* (1848), an historical drama; *Vader Cats* (1855); and *Jolleu en Mietje* (1858), as well as texts for French opera. His collected works in thirty-eight volumes appeared at Ghent (1880-82).

PEEPER. One of the small tree-frogs which in early spring are heard peeping all over the country as the sexes gather in the ponds and puddles for breeding purposes. The first voice heard in this chorus of early March in the Northern States is that of Pickering's or the little yellow tree-toad (*Hyla Pickeringii*). In the Southern States a small greenish peeper, very common, is *Hyla squirella*.

PEEPING TOM OF COVENTRY. The only person in Coventry who disobeyed the injunction not to look out on the street while Lady Godiva (q.v.) rode by. The name has become a conventional term for an inquisitive person.

PEEPUL, PIPUL, or PIPPUL (Hind. *pipal*, from Skt. *pippala*, long pepper, sacred fig tree). *Ficus religiosa*. A species of fig (q.v.) known in Ceylon as the bo tree. It somewhat resembles the banyan, but the branches do not root like those of that tree, and the leaves, rounded at the base, have long attenuated points which are considered special devices for carrying off the water from leaves, a necessary device in wet tropical



PEEPUL.

forests. The tree, which often attains a height of 100 feet or more, is held sacred by the Hindus, who maintain that Vishnu was born under it, hence its name 'sacred fig.' It is frequently planted near temples, and religious devotees spend their lives under its shade. The Buddhists also held it sacred. It is often planted for shade near houses, and by the side of walls. The juice contains caoutchouc, and is used by women as bandoline. Lac insects feed upon the tree, and much lac is obtained from it. The fruit is not much larger than a grape, and, although edible, is not valued.

PEER (OF. *per*, *peir*, Fr. *pair*, peer, equal, from Lat. *par*, equal). A general name applied to the various members of the titled nobility of England. The peerage comprises the ranks of duke, marquis, earl, viscount, and baron. The dignity of the peerage, still hereditary, was in early times also territorial. Life peerages seem to have been not unknown at one time in England; but in 1856, in the case of the law lord Baron Wensleydale, the House of Lords ruled that his creation 'for and during the term of his natural life' did not convey the privilege of a seat and a vote in their House. Women may be peeresses in their own right, either by creation or by inheritance. In France the great vassals of the Crown were very early known as peers, while the legal fiction of a semi-equality with the King was still maintained; the title occurs under Robert I. and Louis VII., though the earliest letters patent creating a peerage which are known are those issued by Philip IV. in favor of Robert II., Count

of Artois. Under Philip Augustus there were six lay peers and six ecclesiastical. When three of the lay peerages were extinguished by union with the Crown, the King created new ones, at first of the blood royal, to counterbalance the ecclesiastical peerages. The policy of Richelieu and Louis XIV. reduced the prerogatives of the peerage to a simple question of precedence, the debates over which occupy such a large part of Saint-Simon's memoirs. Their only privilege was that of sitting in the parliaments and being judged only by these high courts.' At the Revolution there were forty-nine peerages, including five princes of the blood, six spiritual peers (the same archbishops as in the Middle Ages), and thirty-eight lay peers, ranging in seniority from Uzès, 1572, to Aubigny, Choiseul, and Coigny, 1787. The peerage was then suppressed. From 1814 to 1848 a House of Peers was in existence, modeled on the English Upper House. Hereditary succession was abolished in 1830.

PEER GYNT, pār gynt. A dramatic poem by Henrik Ibsen (1867). It has been called the Scandinavian *Faust*, and is a satire on certain Norwegian traits exemplified in the hero. It has, however, a broader application as the story of a human soul. Peer Gynt, as the drama begins, is a peasant, dreamy, selfish, sordid, superstitious, and a liar, leading a life of smatterings. Later the scene changes to foreign lands where Gynt apparently has prospered, but his character remains unchanged. At last, in old age, he returns to his early home, and realizes the worthlessness of his miserable existence, but is saved from utter despair by the devotion of the woman who has loved him from his youth. In spite of its dismal theme, the poem is varied and witty, full of allusions to Northern folk-lore, the name and nature of Peer Gynt being taken from a folk-tale of that title. The composer Grieg has a suite named from the poem and suggested by its theme.

PEERLKAMP, pārl'kămp, Hofman Peter (1786-1865). A prominent Dutch Latinist and critic. He was born at Groningen, studied there and at Leyden, where, after teaching in Haarlem and Dockum, he became professor of classics and ancient history (1822). This chair he resigned in 1848 because of ill health. As a classical scholar, he had a remarkably brilliant style and a purely subjective standard of criticism which led him to judge as interpolations much of Latin poetry. Peerlkamp edited Horace's *Odes* (1834; 2d ed. 1862), his most famous work; Vergil's *Æneid* (1843); Horace's *Ars Poetica* (1845) and *Satires* (1863); as well as Tacitus's *Agricola* (1827; 2d ed. 1864) and the works of Xenophon of Ephesus (1818); and he wrote much on the history of Dutch literature and classical scholarship. He founded (1825) the *Bibliotheca Critica Nova*. Consult Leopold, *Studia Peerlkampiana* (Groningen, 1892).

PEERS, Richard (1645-90). An English author and translator. He was the son of a tanner and was born in Lisburn, in the County of Antrim, Ireland. Disliking his father's trade, to which he was apprenticed, he ran away to England, where he was sent to school by an uncle. He graduated B.A. from Christ Church, Oxford, in 1668, and M.A. in 1671. In recognition of his scholarship, he was elected esquire bedell in the faculty of arts (1675) and afterwards in the faculty of physic. Under the supervision of Dr. John Fell (q.v.), he translated into Latin Anthony à Wood's *History and Antiquities of Oxford* (1674); and unaided made the first catalogue of Oxford graduates under the title of *A Catalogue of Graduates in Divinity, Law, and Physic*, etc. (1689), and contributed to the famous *English Atlas* (vol. iv.) of Moses Pitt, *The Description of the Seventeen Provinces of the Low Countries or Netherlands* (1682). He also published *Verses on Sundry Occasions* (1667). His life was passed in and near Oxford.

PEERYBINGLE, Mrs. In Dickens's *Cricket on the Hearth*, the devoted and cheery little wife of the Carrier John Peerybingle. Her husband called her *Dot*, under which name Dion Boucicault's dramatization of the story was presented in 1862.

PEET, Harvey Prindle (1794-1873). An American educator, born at Bethlehem, Conn. He graduated at Yale in 1822, and two years later became superintendent of the American Asylum for the Education of the Deaf and Dumb, the first institution of the kind in this country. In 1831 he became president of the New York institute for the deaf and dumb. He was the author of *A Course of Instruction for the Deaf and Dumb* (1844-46), and of several other works on deafness and on insanity.

PEET, Stephen Denison (1830—). An American archæologist, born at Euclid, Ohio. He graduated at Beloit College in 1851, studied theology at Andover, Mass., and after 1854 was pastor of Congregational churches in Racine and Clinton, Wis., Ashtabula, Ohio, and Mendon, Ill. He became editor of the *American Antiquarian* and published *History of Early Missions in Wisconsin* (1886), *Religious Beliefs of the Aborigines of North America* (1886), *The Clan Centres and the Clan Habitat of the Effigy Builders* (1891), *The History of the Explorations in the Mississippi Valley* (1896), and *Prehistoric America* (3 vols., 1890-99).

PEF'FER, William Alfred (1851—). An American lawyer and legislator, born in Cumberland County, Pa. He was entirely self-educated. In 1853 he settled in Indiana, in 1859 in Missouri, and later in Illinois. He enlisted in the Eighty-third Illinois regiment in 1862, was mustered out as lieutenant in 1865, and, removing to Kansas, established the Fredonia *Journal* and the Coffeyville *Journal*. In 1874 he was elected to the State Senate, in 1880 was a Republican Presidential elector, and in 1881 assumed the editorship of the *Kansas Farmer*. From 1891 to 1897 he represented the People's Party in the United States Senate, and in 1898 was nominated by the Prohibitionists for Governor of Kansas. Among his publications are: *Peffer's Tariff Manual* (1888); *The Way Out* (1890); *The Farmer's Side* (1891); *Americanism in the Philippines* (1900); *Rise and Fall of Populism in the United States* (1900).

PEG'ASUS (Lat., from Gk. Πήγασος; connected with πηγός, *pēgos*, strong, πηγνύναι, *pēgnynai*, to fasten; popularly derived from πηγή, *pēgē*, spring). In Greek legend, a winged horse, begotten by Poseidon on the Gorgon Medusa, and with Chrysaor springing from her neck when she was beheaded by Perseus. Later by the aid of Athena he was caught at the spring Peirene in

Corinth by Bellerophon, who used him in his conflict with the Chimæra, and his later wars. Afterwards he was said to have flown to heaven, and later writers told how he had been placed among the stars. The Alexandrian poets seem to have been the first to attribute the spring Hippocrene on Mount Helicon to a blow of Pegasus's hoof, and the same story is found in connection with Aganippe and several other fountains in Greece. This story brought Pegasus into connection with the Muses of Mount Helicon, and as the spring-inspired poets we find them honoring Pegasus for his gift. As the poet's horse on which he is carried from the earth into the realms of poetic fancy, Pegasus is unknown to antiquity. That conception seems to appear first in Boiardo's *Orlando Innamorato*. Consult Hannig, *De Pegaso* (Breslau, 1901).

PEG'GOTTY. The name of a family in Dickens's *David Copperfield*, consisting of Clara Peggotty, David's devoted nurse, who married Barkis, the carrier, her brother Dan, and nephew Ham, Yarmouth boatmen, who live in a remodeled barge with Little Emily and Mrs. Gummidge.

PEGMATITE (from Gk. πῆγμα, *pēgma*, anything fastened together, from πήγνυναι, *pēgnynai*, to fasten). A coarse-grained rock of siliceous composition occurring in dikes or veins and generally in association with a parent mass of granite rock. Most pegmatites have the composition of a siliceous granite. They are made up chiefly of feldspar (orthoclase, microcline, plagioclase), quartz, and muscovite; but they are also the home of many of the minerals containing rarer chemical elements, such, for example, as boron, beryllium, uranium, cerium, etc. Pegmatites supply the feldspar for porcelain and the mica for isinglass. They are in part of igneous and in part of aqueous or aqueo-igneous origin.

PE'GRAM, John (1832-65). An American soldier, born at Petersburg, Va. He graduated at West Point in 1854, and was assigned to frontier duty with the First Dragoons. On February 28, 1857, he was appointed first lieutenant. He served as assistant instructor of cavalry, and took part in the Utah Expedition of 1857-58. From 1858 to 1860 he was on leave, traveling and studying in Europe, and on his return served against the Indians in New Mexico. He resigned on May 10, 1861, and became a captain of cavalry in the Confederate army. In June and July he was lieutenant-colonel in General Garnett's operations around Beverly in western Virginia, and was captured at Rich Mountain (July 11). When exchanged, he was sent in July, 1862, to General Bragg in Mississippi as chief of engineers, and afterwards was chief of staff for Gen. E. Kirby Smith in Tennessee. He was made brigadier-general of cavalry in November, 1862, was engaged at Murfreesboro, and commanded a division at Chickamauga. He was transferred to the Army of Northern Virginia, Early's division, Second Corps, and repulsed an attempt to turn the right Confederate flank at the Wilderness. He served in the campaign against Sheridan in the Shenandoah in the fall of 1864, and was promoted major-general. While on service around Richmond he was mortally wounded in the skirmish at Hatcher's Run in February, 1865.

PEGU, pē-gōō'. A division of Lower Burma (q.v.). British India (Map: Burma, C 3). Area, 13,106 square miles. Population, in 1891, 1,522,500; in 1901, 1,819,000. It comprises the districts of Pegu, Rangoon, Hanthawaddy, Tharrawaddy, and Prome. It is watered by the Irrawaddy, the Rangoon, the Pegu, and the Sittang. The surface is uneven, attaining in the Arracan Yoma Mountains, on the west boundary, a maximum altitude of about 6000 feet. The climate is warm and humid, but not unhealthful. The soil is fertile; the river valleys are well cultivated and highly productive; and there are extensive forests of valuable trees. Rice is the principal crop, and teak timber is largely exported. The Peguans belong by race to the Mons (q.v.), one of the great groups of primitive peoples of Indo-China. Pegu was an independent Talaing kingdom until 1752; its subsequent history is merged with that of Burma (q.v.). It became British in 1852.

PEGU. The capital of a division of Southern Burma, on the Pegu River, at its confluence with the Irrawaddy, 40 miles northeast of Rangoon (Map: Burma, C 3). Before its destruction by Alompsa in 1757 it was a large and fine city, said to have had over 100,000 inhabitants. Its population is now about 12,000. It contains a number of interesting pagodas, a colossal recumbent figure of Buddha, and many ancient relics.

PEHLEVI, pā'lā-vē, more correctly pāk'lā-vē. See Pahlavi Language and Literature.

PEI-HO, pā'hō' *or* pī'hō' (Chin., white river). The most important river of North China (Map: China, E 4). It rises near the Great Wall north of Peking, flows southward, receiving several tributaries, past T'ung-chow fu, 12 miles east of Peking, to Tien-tsin, where it takes a southeastern course and falls into the Gulf of Pe-chi-li at Taku (q.v.), its course being wholly within the Province of Chi-li. At Tien-tsin it receives from the northwest the Hun-ho, swollen by the accession near its confluence with the Pei-ho of the waters of many rivers, with numerous feeders, from the west and southwest. Here, also, it connects with the Grand Canal. Its course is very tortuous, especially below Tien-tsin, the distance from that point to Taku by water being 80 miles, but only 35 by land. Its waters are thick with silt, but are navigable by coast and river steamers as far as Tien-tsin and by native vessels above that point to T'ung-chow. There is a bar of stiff clay at its mouth which greatly impairs its value as a waterway, and the water along the coast is so shallow that heavily laden vessels cannot approach nearer than eight miles. The total length of the river is estimated at 350 miles.

PEILE, pēl, John (1838—). An English philologist, born at Whitehaven, Cumberland. He studied at Christ's College, Cambridge, where he was fellow and lecturer in 1860, and in 1887 master. Peile took much interest in university extension. He published: *Introduction to Greek and Latin Etymology* (1869) and *Primer of Philology* (1877), both popular works; *Notes to the Tale of Nala* (1881); and a *History of Christ's College* (1900).

PEINE, pī'ne. A town in the Province of Hanover, Prussia, on the Fuse, 20 miles southeast of Hanover (Map: Prussia, D 2). It has cattle markets, breweries, and manufactures of iron, sugar, furniture, jute goods, malt, artificial

guano, etc. Population, in 1890, 10,100; in 1900, 15,400. Peine was founded in the ninth century.

PEINE FORTE ET DURE, pān fôrt ā dur (OF., strong and hard punishment). A punishment formerly imposed by the laws of England upon persons who, on being arraigned for felony (q.v.), refused to plead, stood mute or peremptorily challenged more than twenty jurors, which was considered a contumacy equivalent to standing mute. By the early English law, an accused person must plead 'guilty' or 'not guilty' before he could be tried, and the form of coercion hereinafter described was devised to force an accused person to plead in case of his obstinate refusal.

In the beginning of the thirteenth century the penalty consisted merely of a long imprisonment and a low diet, persisted in until the prisoner submitted. However, by the reign of Henry IV. it had become the practice to lay the accused on his back on a bare floor, place on his body as great a weight of iron "as he could bear, and more," and give him only the 'worst' bread and water from the nearest stagnant pool until he consented to plead or died. During the fifteenth, sixteenth, seventeenth, and even the eighteenth centuries, a number of cases are recorded of the infliction of the above punishment for 'standing mute' on an arraignment for felony.

This form of coercion of a plea was finally abolished in 1772, by the statute of 12 Geo. III., chap. 20, which provided that 'standing mute' on an arraignment for felony should be considered as equivalent to conviction. This harsh rule was altered by the statute of 7\&8 Geo. IV., chap. 28, by the humane provision that a plea of 'not guilty' should be entered in case of the refusal of a prisoner to plead, and this rule prevails everywhere to-day.

American records are stained by only one well-authenticated instance of the infliction of this torture. One Giles Cory, accused of being a witch, refused to plead on his arraignment, and was pressed to death at Salem, Mass., in 1692. Consult Stephens, *History of the Criminal Law of England* (London, 1883).

PEIPUS, pī'pŭs (Russ. *Tchudskoye Ozero*). A large lake in the Baltic Provinces of Northwestern Russia. It lies 30 miles south of the Gulf of Finland, into which it is drained through the Narova River (Map: Russia, C 3). It is 45 miles long and 20 miles broad, and connects southward through a narrow channel with Lake Pskov. Its banks are low and sandy, and for the greater part wooded, and it is rich in fish, which supply the markets of Saint Petersburg. The lake is deep enough for large vessels, and is navigated by steamers. It was formerly the chief waterway between the Hanse towns of the Baltic and the interior of Russia.

PEIRCE, pērs *or* pĕrs, Benjamin (1809-80). An American mathematician and astronomer, born at Salem, Mass. He graduated at Harvard College in 1829. He became tutor there in 1831; professor of mathematics and physics in 1833, and Perkins professor of mathematics and astronomy in 1842, which position he held till his death. In 1849 he became consulting astronomer to the *American Ephemeris and Nautical Almanac*, and in 1855 one of the council to organize the Dudley Observatory, Albany. In 1867 he succeeded Professor A. D. Bache as superintendent of the Coast Survey, in which service he continued till 1874. In his early life he was a contributor to the *Mathematical Miscellany*, and also published the *Cambridge Miscellany of Mathematics, Physics, and Astronomy*, in which appeared his celebrated investigation of the motion of a top spinning on a plane surface. He also prepared a series of mathematical text books for the use of the university, and it was chiefly by his exertions that the Harvard Observatory was established and perfected. In 1851 he published in the *Astronomical Journal* remarkable papers on the constitution of Saturn's rings, in which he considered the conditions of statical equilibrium of a transverse section of the ring, and came to the conclusion that if there are separate rings, they must be more numerous than Laplace had even supposed. (See Saturn.) In 1857 he published the *System of Analytical Mechanics*. Among his important contributions to mechanics may be mentioned his investigation of the forms of an elastic sac containing a fluid, a subject which led to the theory of analytic morphology. His contributions to mathematics are of the broadest and profoundest character. They are principally embraced in certain communications on *Linear Associative Algebra*, to the National Academy of Sciences, which had been suggested by the publication by Hamilton in 1852 of his quaternions. These communications were collected in 1870, and 100 lithograph copies were published. It was reprinted in the *American Journal of Mathematics* (1882). Peirce was a member of various learned societies in Europe and America.

PEIRCE, Benjamin Osgood (1854—). An American mathematician and physicist, born in Beverly, Mass. He graduated at Harvard in 1876; studied in Leipzig and Berlin after acting as assistant in physics at Harvard for a year; taught in the Boston Latin School; was instructor in mathematics at Harvard from 1881 to 1884, and was promoted from an assistant professorship to the Hollis chair of mathematics and natural philosophy. He contributed to the *Proceedings* of the American Academy of Sciences many papers on magnetism, electricity, and heat, and published a *Table of Integrals* (1899).

PEIRCE, Bradford Kinney (1819-89). A minister of the Methodist Episcopal Church. He was born at Royalton, Vt., graduated at Wesleyan University, Middletown, Conn., 1841, and joined the New England Conference 1846. He was editor of the *Sunday-school Messenger* and *Sunday-school Teacher*, 1844-45; agent of the American Sunday School Union 1854-56; State Senator 1855-56; superintendent and chaplain of the State Industrial School, Lancaster, Mass., 1856-62; chaplain of the house of refuge on Randall's Island, New York, 1862-72; editor of *Zion's Herald*, 1872-1888; financial agent for Boston University, 1889. He wrote *The Bible Scholar's Manual* (1847); *Notes on the Acts* (1848); *The Eminent Dead* (1851); a series of question books for Sunday-school scholars (1849-52); *Trials of an Inventor* (1866); *The Word of God Opened* (1868); *A Half Century With Juvenile Delinquents* (1869).

PEIRCE, Charles Sanders (1839—). An American physicist, born in Cambridge, Mass. He graduated at Harvard in 1859, and at the

Lawrence Scientific School in 1863. Entering the United States Coast Survey, in 1872 he conducted a valuable series of pendulum experiments to determine the density and shape of the earth. He was a lecturer on logic at the Johns Hopkins and Harvard Universities, and in 1869 lectured on philosophy before the Lowell Institute of Boston. In 1876 he was elected a member of the National Academy of Science. He was a member of the staff of the *Century Dictionary*.

PEIRCE, JAMES MILLS (1834—). An American mathematician, born at Cambridge, Mass. He graduated at Harvard in 1853, and after several years of tutoring became an assistant professor of mathematics there in 1861. In 1869 he was raised to the rank of professor and in 1885 was appointed Perkins professor. Among his publications are *A Text-book of Analytic Geometry* (1857); *Three and Four Place Tables of Logarithmic and Trigonometric Functions* (1871); and *The Elements of Logarithms* (1874).

PEIROL, på'rôl' (?-c.1225). A French troubadour, so called from his birthplace, Peirol in Auvergne. The Dauphin, Robert of Auvergne, received him at his Court. But there Peirol met and loved Robert's sister, Assalide, or Sail de Claustra as he calls her in his verse, and according to the Provençal *Life* of the poet for a time lived at Court as her favorite with Robert's knowledge, but was finally exiled by the jealous Dauphin. In the Crusade of 1189 he seems to have taken an active part. On his return, he lived at Montferrat, whence in all probability he made a pilgrimage to the East. If we are to believe the manuscript *Life*, he settled at Montpellier and there married and died. His poems, thirty canzones and his part of a few tenzons, are especially valuable as contributions to the history of the spirit of the Crusades.

PEISHEVA. See PESHWA.

PEISIS'TRATUS. See PISISTRATUS.

PEIXOTO, på-shō'tô, FLORIANO (1842-95). A Brazilian soldier and politician, born at Pico, in the Province of Alagoas. He entered the army as a private, rose rapidly, and distinguished himself in the war with Paraguay. In 1889 he assisted Fonseca in establishing the Republic, and after serving as Minister of Finance was elected Vice-President in 1891. Fonseca resigned from the Presidency in the same year, and Peixoto took his place. As leader of the military party he was somewhat unpopular, and had to cope with a great revolt headed by Mello and Da Gama, and with insurrections in various parts of the Republic. He was unsuccessful in his candidacy for reëlection, and was succeeded in 1894 by Moraes. Consult: Luiz José Pereira da Silva, *Floriano Peixoto* (Rio de Janeiro, 1894). See BRAZIL.

PEIXOTO, IGNACIO JOSÉ DE ALVARENGA (1748-93). A Brazilian poet, born in Rio de Janeiro. He was educated in Portugal at the University of Coimbra and studied law at Cintra. He returned to Brazil in 1776 and was made a judge in São-João-d'El-Rei, in the interior Province of Minas Geraes. He was one of the twelve arrested for implication in the republican plots, and was kept for two years in a dungeon without trial; but his death sentence was commuted to deportation to Angola, in Portuguese Africa. Some of his poems, which rank among the best in the Portuguese tongue, were published in Paris in 1866, under the title *Obras poeticas, colligidas annotadas, precedidas de juizos criticos*.

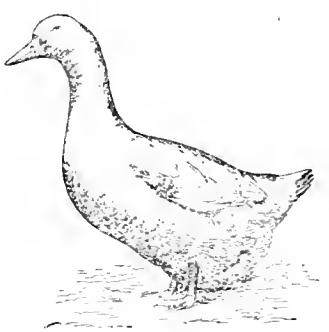
PEK'AN, or PENNANT'S MARTEN. See FISHER.

PEKEA TREE. A tropical American tree. See CARYOCAR.

PEKIN. The capital of China. See PEKING.

PE'KIN. A city and the county-seat of Tazewell County, Ill., ten miles south of Peoria; on the Illinois River, and on the Cleveland, Cincinnati, Chicago and St. Louis, the Chicago and Alton, the Illinois Central, the Atchison, Topeka and Santa Fe, the Chicago, Peoria and Saint Louis, and other railroads (Map: Illinois, C 3). It has a public library and fine public school buildings. In the vicinity are productive veins of coal and fertile agricultural lands. The city is a noted grain market and controls an important shipping trade by rail and water. Its manufactures also are extensive, and include agricultural implements, plows, wagons, carriages, beet sugar, glucose, spirits, alcohol, ammonia salts, fertilizer, brick and tile, organs, foundry products, planing mill products, etc. Settled in 1829, Pekin was incorporated first in 1850. The government is administered under a revised charter of 1875 which provides for a mayor, elected every two years, and a council. Population, in 1890, 6347; in 1900, 8420.

PEKIN DUCK. A domestic duck introduced from China about 1870, which has become widely extended and popular, both for the table and as a producer of excellent eggs. In color it is white or cream-white, with deep yellow bill, lead-blue



WHITE PEKIN DUCK.

eyes, and orange feet. The body is long and deep, the size large, some birds weighing as much as twenty pounds to the pair, and the breed is hardy, easily raised, and profitable.

PEKING, pē'king' *or* pā'king' (Chin., Northern Capital); or, in the Court dialect, **PEI-CHING,** pā'ching'. The capital of the Empire of China, coincident in position and area with the chief city of the Department of Shun-t'ien-fu, in the Province of Chih-li (see PE-CHI-LI), but not within the jurisdiction of the Governor-General or so-called 'Viceroy' of Chih-li (Map: China, E 4). It has been the seat of the Imperial government since 1409, and is called Peking, or "northern capital," to distinguish it from Kiang-ning-fu, south of the Yang-tse, which had been the seat of the capital from 1368 to that date, and is now known as Nanking (q.v.).

Peking is a walled and moated city, with an area of about twenty-five square miles, and is

situated in a sloping sandy plain about twelve miles west of the Pei-ho (q.v.), 70 miles southeast of the Great Wall, and 100 miles from the Taku Forts, where the Pei-ho enters the Gulf of Pe-chi-li. The Imperial Observatory stands in lat. 39° 54′ 31″ N., and in long. 116° 28′ 24″ east of Greenwich. The elevation above the sea is about 120 feet. The city is surrounded on three sides by mountains distant from 10 to 30 miles, the mountains in the west providing cool breathing spots for the foreign residents in summer, as well as an abundant supply of coal for all seasons. Peking is in the main healthful. The climate is that of North China generally, intensely cold in winter (zero and below), the city, however, being sheltered somewhat by the high walls, while the heat in summer is great, cooling winds being barred out by the height of the walls.

General Description. Peking consists of two parts of different shapes, sizes, and dates: The Tatar or 'Inner' city, which lies to the north, and the Chinese or 'Outer' city, which adjoins the other on the south, the south wall of the Tatar city forming the main part of the north wall of the Chinese city. The former, which is nearly square, has a circuit of about 12.3 English miles, and the latter, which has its greatest extension from west to east, is an imperfect parallelogram measuring five miles by two. The walls of both cities are of earth and concrete, faced within and without with brick. Those of the Tatar city are 40 feet high, 62 feet thick at the base, and 34 at the top, access from within to the top being by stone-paved ramparts. The walls are strengthened at intervals of 60 yards by huge buttresses which project outward 50 feet, and the parapets of both walls and buttresses are loopholed and crenelated. The Chinese city walls are only 30 feet high, and 25 feet thick at the base. These walls are pierced by 16 gates, 9 of which are in the Tatar city (3 in the south wall, communicating with the Chinese city, and 2 in each of the other three sides). Of the 7 gates in the Chinese city, 3 are in the south wall, one in the east wall, one in the west, and 2 in those portions of the north wall which project east and west for a quarter of a mile beyond the common wall of the Tatar and Chinese cities, and open toward the north. Each gate is protected by a demi-lune or enceinte, and is surmounted by a lofty three-storied tower 99 Chinese feet (about 119 English feet) in height, and covered with green glazed tiles. The Ch'ien mên, or 'Front Gate' in the centre of the south wall of the Tatar city, like the Yung-ting gate of the south wall of the Chinese city, has 3 entrances, the one in the centre being reserved for the Emperor. All gates are closed at sunset.

The Chinese city, built in 1543, is newer than the Tatar city, which was built by Kublai Khan in 1267-71. It contains many vacant spaces, but the bulk of the population is here. Entering by the Yung-ting gate in the south wall, a roadway 2 miles in length leads due north to the Ch'ien-mên or 'Front Gate,' the main entrance to the Tatar city. On the right or east side of this roadway stands the inclosure (one square mile in extent) containing the Altar of Heaven, surrounded with temples and shrines, including the circular triple-roofed Temple of Heaven, about 119 English feet high. It was burned down in 1889, but has been rebuilt, Oregon pine being used for the pillars. It is roofed with blue porcelain tiles. Here at midnight of the winter solstice, the Emperor, after due fasting and prayer, worships Shang-ti, the 'Supreme Ruler,' with prayer, hymns, prostrations, and burnt-offerings of oxen, sheep, hares, etc., and of silk, jade, and other precious things. On the west side of the roadway stands the Temple of Agriculture, dedicated to Shin-nung (q.v.), the 'Divine Husbandman.' In this spot every year at the 'opening of spring' the Emperor plows a furrow or two and thus inaugurates for the year the principal industry of his people. In the Chinese city most of the mercantile business of the city is carried on. It also has a powder factory, an Imperial pottery, a mosque, and many theatres. Here also is the fashionable promenade known as Booksellers Street, where curios of all sorts, precious stones, etc., can be bought. Proceeding northward about half way to the entrance to the Tatar city is a magnificent marble bridge, an essential, according to the requirements of Fŭng-shui. Within the Tatar city the first important cross street to the right is 'Legation Street,' a macadamized thoroughfare, extending southeastwardly. Here are the foreign legations, the headquarters of the Imperial maritime customs, the hotel, the two foreign banks, etc.; and here the fury of the bloody Boxer outbreak concentrated as far as the city of Peking was concerned.

Immediately north of the Great Gate is a paved square bordered by a stone palisade. The Mongol market is found here. North of this square is the outer gate leading to the Hwang-ch'ing or 'Imperial City,' walled and towered like the Tatar city itself. From this a wide avenue leads for a quarter of a mile to the inner gate, within which right and left are seen the temples of ancestors and of grain. A mile and a half farther brings us to the entrance of the Tsze-kin-ch'ing or 'Purple Forbidden City,' a great walled inclosure with towers on the corners and over the gates, one square mile in extent, containing the Imperial Palace and its pleasure grounds and gardens, as well as the numerous reception halls, pavilions, and offices required by the Emperor and his high officers of State in conducting the affairs of his great Empire, all roofed with yellow porcelain tiles. North of all this is the beautiful finely wooded artificial hill called King-shan, or 'Prospect Hill,' 170 feet high, with five peaks, each having a Buddhist temple on top, the whole surrounded with a park a mile in circuit. Continuing northward, the traveler passes through the 'back gate' into the Imperial City, where is the palace of the Ti-tu, or General, who is responsible for the peace of the city. Northward still is the gate leading from the Imperial into the Tatar city.

It is seen that the Tatar city is really a nest of cities, with the Forbidden City in the centre, the Forbidden City being surrounded by the Hwang or Imperial City (six miles in circuit), containing Government offices, temples, pleasure-grounds, a beautiful artificial lake on the west side, the White Ming pagoda built on the spot where the last Emperor of the Ming dynasty hanged himself (1643), the Pei-t'ang, or Roman Catholic cathedral, and many elegant residences of princes, and of officers of the Government. The Tatar city thus surrounds both the Forbidden and the Imperial cities. Originally intended for Manchus alone, it is now largely occupied by Chinese. It contains the public offi-

ces of the Eight Boards or Government departments, including the Wai Wu Pu, or Foreign Office, which recently superseded the Tsung-li Yamên; the Imperial Censorate, the site of the Han-lin (q.v.), adjoining the British Legation on the north and burned down with its unreplaceable libraries, during the Boxer disturbances; the Imperial University; the Examination Hall, with its 10,000 cells for the triennial competitive literary examinations; the Imperial Observatory; the Christian mission houses, churches, and schools in different parts of the city (mostly burned down by the Boxers); Confucian, Buddhist, Taoist, and Lamaistic temples; a great drum-tower, etc. There is in addition the temple erected in 1578 to house the great bronze bell, 17 feet high, 12 feet 8 inches in diameter, weighing 87,000 pounds, cast in the early years of the fifteenth century, and covered within and without with quotations from the Buddhist scriptures. There is also another Roman Catholic cathedral. It is situated in the southwest part of the city.

The principal streets of Peking are lined with shops, gorgeously painted, and decorated with great pendent signs with gilt characters. At times the streets are very noisy and full of activity. Besides the hurrying to and fro of mandarins and their followers, Government messengers, envoys from vassal States and provinces, Mongols with their big Bactrian camels, yellow-robed Tibetan and Mongol lamas, itinerant vendors of amusement, or of infallible medicines, or of things to eat or wear, make up a scene of great interest. The principal conveyances are the sedan chair and the springless covered carts, politely called 'carriages.' The smaller streets are filthy and vile-smelling, but since the post-Boxer military occupation many improvements have been inaugurated by the reforming and progressive prince in whose charge the streets have been placed. The sewers have been thoroughly cleaned out, and the practice of sprinkling the dusty roads with the foul liquid from the gutters has been suppressed. Macadamizing is everywhere in progress.

GOVERNMENT. The peace of the city is in charge of a board, consisting of the Chih-fu (head of the Department of Shun-t'ien), the two Chih-hien (heads of the two prefectures included within the city), five members of the Board of Censors, and the Ti-tu, or general. Besides the military, 12,000 police are subject to this board, 10 being stationed at each barrier. Each of these has 150 runners under him. The Tatar garrison is divided into 8 banners, each in three divisions (Mongol, Manchu, and Chinese).

The population of Peking is estimated at 1,300,000.

ENVIRONS. Without the city are many points of great interest. On the east side is the Temple of the Sun, and on the west the Temple of the Moon, where the Emperor worships at the summer solstice. On the north, outside the An-ting Gate, is the Altar of Earth, where the Emperor worships at the vernal equinox. To the northwest are the tombs of the Ming emperors (except two, who were buried at Nanking), approached through a long avenue of colossal lions, unicorns, camels, elephants, and horses, in marble, two pairs of each. Nine miles northwest is the celebrated Yuen-Ming Yuen, or 'Summer Palace.'

HISTORY. From the earliest times there has been a city on or near this spot. In 937 the Khitan Tatars, who had conquered North China, made it one of their capitals and called it Nan-king, or 'Southern Capital,' the northern being in Tatary. In 1151 the Kin Tatars called it Chung-tu, or 'Middle Capital.' In 1215 the city was captured by Genghiz Khan, and in 1264 Kublai Khan made his capital here and built the present Tatar city, called Ta-tu, or 'Great Capital,' in Chinese, and called Khan-baligh, or 'City of the Khan,' in Mongol, the Kambálu of Marco Polo. The third Emperor of the Ming dynasty settled here in 1409, caused 12½ miles of its length to be cut off, and built the present north wall. The ruins of this discarded section can still be traced. The Manchus in 1643 accepted the city as they found it, but have improved it much. In 1860 it was spared by the Anglo-French expedition, who had no quarrel with the people. By agreement, however, they held the An-ting gate during the negotiations. On August 14, 1900, its walls were breached and entered by the allied forces sent to relieve the foreigners besieged in the British legation, and the city was held by the troops until September, 1901. In 1884 Peking was brought into telegraphic communication with the rest of the world. In 1897 it was connected by rail with Tien-tsin, the terminus remaining outside the south gate until the military occupation made it necessary to carry it into the city. The station is now opposite the Altar of Heaven. Peking is now also in railway connection with Shan-hai-kwan and Manchuria and through the Russian lines with Europe.

BIBLIOGRAPHY. Yule, *The Book of Ser Marco Polo* (2 vols., London, 1875); Bretschneider, *Archæological Researches in Peking and Its Environs* (Shanghai, 1876); Edkins, in Williamson's *Journeys in North China, Manchuria, and Mongolia* (2 vols, London, 1870); Favier, *Peking: Histoire et description* (Paris, 1902; Pt. 1, Hist. of China; Pt. 2, Peking); Allen, *The Siege of the Legations* (London, 1901); Martin, *The Siege in Peking* (New York and Chicago, 1900); Smith, *China in Convulsion* (New York and Chicago, 1901); etc.

PELADAN, pā'lā'dăN', JOSÉPHIN, called 'Le Sar' (1859—). A French mystic, novelist and art-critic, born in Lyons. He became known as a disciple of Barbey d'Aurevilly, posed as a descendant of the last kings of Babylonia, assuming the title 'Sar' (chief) and a theatrical costume, and attracted increasing attention by a series of novels under the general title of *La décadence latine*, which include *Le vice suprême* (1886), *Curieuse* (1886), *L'initiation sentimentale* (1887); *Le cœur perdu* (1888), *Istar* (1888), *La victoire du mari* (1889), *Cœur en peine* (1890), *L'androgyne* (1890), and *Le gynandre* (1891). These works are an extraordinary mixture of originality and merely riotous imagination, in which human passions, astrological dreams, esoteric doctrines, and astral adventures vie with one another for precedence, and the subtlest sensuality does not come off a loser. Entirely distinct from this cycle is the novel *Femmes honnêtes* (1885). As art critic he published *Rembrandt* (1881), *Une introduction à l'histoire des peintres de toutes les écoles* (1884), and *La décadence esthétique* (1888). He founded the order of "La Rose Croix. Croix du

Temple" in 1892, and the cult spread prodigiously for a few years. In spite of many absurdities, it seems really to have been a reaction against much that was purely material in French art, a reaction that had its equivalent in the Pre-Raphaelite movement in England several years earlier. The Rosicrucians held Salons, called the 'Esthetic Geste,' and gave concerts, lectures, and plays written by the Sar Peladan.

PELA'GIANISM. A fifth-century Western heresy, which originated with the monk Pelagius (q.v.), who denied the dependence of the human will upon grace, in opposition to Augustine's doctrine of the necessity of divine assistance, and minimized the consequences of Adam's fall, thus denying the doctrine of original sin. The views commonly called Pelagian are not foreign to Greek Christianity. The later Origenists, who are generally thought of only as interested in the Christological discussions, had much sympathy with the teaching of Pelagius. So, for instance, Theodore of Mopsuestia, to whom Nestorianism was largely indebted, held that Adam's transgression wrought no special injury to his descendants. It has been suggested that 'the Nestorian Christ' would be the 'fitting Saviour for the Pelagian man.' (See NESTORIUS.) On the other hand, it has often been charged by the Pelagians and their apologists that their opponents held the Manichæan view of the matter, and that it influenced their conception of original sin, as if the physical body were itself essentially evil. See MANICHEISM.

Pelagius spent some time in Rome, in high repute, before raising the issue which was so deeply to agitate the Western Church. About the year 405 he openly objected to a prayer contained in Augustine's *Confessions*, "Give what thou commandest, and command what thou wilt," on the ground that it tended to destroy all sense of responsibility. He was soon joined by an able ally, Cœlestius, who had been trained as an advocate, and whose subsequent history is bound up with the Pelagian cause. Fleeing before the Gothic invasion (410), the two friends made their way to Africa, where Augustine was then engaged in his controversy with the Donatists (q.v.). Here Pelagius taught that infant baptism was administered not to remove the stain of sin, because infants had none, but rather to sanctify and admit them to the kingdom of heaven. This was not Augustine's view at all, and as soon as the Donatist dispute permitted he turned to deal with the new foe. By that time, however, Pelagius had left Africa for Palestine, but Cœlestius remained and was seeking ordination as a presbyter. Objection was raised by one Paulinus, a deacon from Milan, who charged Cœlestius with error. He was examined before a synod (412) and condemned for teaching that Adam would have died even if he had not sinned; that Adam's transgression injured only himself; that infants are born into the state in which Adam was before the fall; that unbaptized infants, dying in infancy, have eternal life; that men may attain heaven through a righteous life (keeping the law), as well as through the Gospel; that some men have lived without sin, and others may; and that men can easily live without sin, if they will. In opposition to these views Augustine maintained that Adam's sin affected the race, involving all mankind in guilt; that physical death is the penalty of sin; that infants are baptized for the remission of original (inherited) sin; and that the only sinless man in the world was Jesus Christ. Most of these ideas are found in his earliest anti-Pelagian work, *The Deserts of Sins and Their Remission* (written in 412).

The arrival of Pelagius in Palestine opened the first chapter in the Eastern history of the controversy. Not a few Origenists sympathized with his views, and none of them openly opposed him. But Jerome (q.v.), and a little later the Spanish presbyter Orosius, promptly opened the attack. A synod was summoned by John, Bishop of Jerusalem, to consider the question (415), and to it Orosius reported the action of the African clergy in the case of Cœlestius. During the examination of Pelagius his Latin and the synod's Greek seem to have occasioned some misunderstanding, but he finally consented to anathematize any one who taught "that man can ever become perfect without God's aid," and this so far satisfied the synod that it dissolved without condemning him. Orosius, however, and some others, felt that the Bishop had not been impartial in his conduct of the inquiry. At the more important synod of Diospolis, presided over by Eulogius, of Cæsarea (415), Pelagius either disavowed or explained away the heretical opinions with which he was charged, and was thereupon pronounced orthodox —a result which angered Jerome, and caused Augustine afterwards to declare that Pelagius had deceived his judges. Pelagius now proceeded to issue his treatise *On Free Will*, which was presently supported by Theodore of Mopsuestia, who attacked Jerome's idea that "men sin by nature, not by will."

Upon Orosius's return to Carthage, a synod was held (416), reaffirming the adverse judgment of the African Church and appealing to Innocent, Bishop of Rome, to aid in opposing Pelagianism with "the authority of the Apostolic See." A similar appeal was made by the Synod of Mileve, in Numidia. Innocent replied as they had hoped he would, saying that Pelagians must be excluded from the Church. Two months later he was succeeded by Zosimus, a Greek, who proved more friendly to the Pelagians than his predecessor. To him Cœlestius appealed in person, and after examination, in which he denied the heretical opinions charged against him and made a formal profession of faith, the Pope refused to condemn him, although he cautioned him to abstain from pursuing further his unprofitable speculations. Soon after this Zosimus received from Pelagius a written statement of belief, similar to that of Cœlestius, on the strength of which he too escaped condemnation. The African clergy were greatly disturbed at the Pope's action, reversing as it did the policy of Innocent, but they were not to be turned from their position. Another large synod reaffirmed once more the condemnation of Pelagianism, and urged upon Zosimus a reconsideration of the whole case. Their action, coupled with the fact that at this juncture the Emperor Honorius issued a strong anti-Pelagian decree, aroused the Pope to action. He reversed his judgment, and now wrote a circular letter to the bishops, calling upon them to assent to the condemnation of Pelagius and Cœlestius, and setting forth in Augustinian terms the true doctrine of sin and

grace. This document is known as the *Epistola Tractoria*, and its date is 418. What may be regarded as the final collective action in the West was taken by a great national synod, held the same year in Carthage, whose decrees anathematize Pelagianism in clear and unmistakable terms. Soon afterwards Augustine wrote his two works, *On the Grace of Christ* and *On Original Sin*, in which he argues that all man's righteousness comes from God, who is the ultimate principle of goodness, back of every impulse of the human heart. Here one may find the uncompromising doctrine of the necessity of divine grace which is characteristic of Augustinianism. And here, too, is that last resort to which Augustine more than once was driven by the logic of his opponents, the inscrutability of God's dealings with His creatures, expressed in the words of Saint Paul, "O the depth of the riches, both of the wisdom and the knowledge of God!" (Rom. xi. 33). Augustine had indeed reached the boundaries of knowledge.

But Augustinianism was not yet victorious. Eighteen Italian bishops refused their assent to the *Tractoria* of Zosimus, among them Julian of Eclanum, one of the best debaters on the Pelagian side. These bishops were promptly excommunicated, but Julian headed a schism which lasted for several years and gave the Church no little trouble. The Pelagians took refuge in the East, where, among others, the patriarch Nestorius showed them favor. But their partial alliance with him proved disastrous in the end, for at the Third Ecumenical Council (Ephesus, 431) both Nestorius and Pelagius were condemned. This result was largely due to the untiring efforts of Marius Mercator, a layman from the West, to whom we owe much of our information on the subject. Pelagian views did not at once disappear, either in the East or in the West; for their subsequent history, see SEMI-PELAGIANISM. Besides the works referred to under PELAGIUS, consult: Hefele, *History of the Councils*, vol. ii. (Eng. trans., Edinburgh, 1876); Harnack, *History of Dogma*, vol. v. (Eng. trans., London, 1898); Rainy, *The Ancient Catholic Church* (New York, 1902).

PELAGIC ANIMALS (from Gk. πελαγικός, *pelagikos*, relating to the open sea, from πέλαγος, *pelagos*, open sea). The pelagic or surface fauna of the ocean comprises an assemblage of animals which live on the high seas, far from land. They live permanently at or near the surface of the ocean, in the warmer parts of the earth. Among them are many Foraminifera, of which Globigerina is the most abundant, also the Radiolaria (q.v.), Siphonophora (q.v.), many Medusæ (q.v.), all the Ctenophora, many entomostracous Crustacea, certain schizopod Crustacea, as Mysis, pteropod and heteropod mollusks, the nudibranch Glaucus, the Salpæ (q.v.), and most cephalopods, as the squid and calamary; while the flying-fish, certain little fishes (Antennariidæ) nesting in gulf-weed, many sharks, and the whales and porpoises make up the assemblage.

The pelagic invertebrate animals, such as the Medusæ, Salpæ, etc., are very transparent, either colorless or with blue or violet tints. The pelagic fishes are usually gray or steel-blue above, white beneath, not being so strikingly marked as those frequenting the shore or coral reefs. See OOZE; PLANKTON; LANTERN-FISH.

PELAGIUS, pē-lā'jĭ-ŭs. A British monk, author of the Pelagian heresy, who flourished during the first quarter of the fifth century. The dates of his birth and death are unknown. A late and uncertain tradition says that his name was Morgan (*Morigena*, sea-born), of which Pelagius (Πέλαγιος) would be the Greek translation. Some of his theological opponents describe him as immoral, but Augustine calls him a "holy man, who has made no small progress in the Christian life." The history of his life begins with his visit to Rome, whither he went probably in the year 401; thenceforth it is that of the Pelagian controversy, for which see PELAGIANISM. Nothing is known with certainty of the close of Pelagius's life, but one tradition says that he died in Palestine at the age of about seventy years. Among his writings we have the creed which he submitted to Bishop Zosimus, a letter to Demetrius about the ascetic life, and some fragments. He wrote a work *On the Trinity*, another *On Free Will*, a *Commentary on Paul's Epistles*, probably extant in a revised form among the works of Jerome, and the *Eulogia*, a collection of extracts from the Scriptures, for use as an aid to Christian living. Consult: Augustine, *Anti-Pelagian Works*, Eng. trans. in *The Nicene Fathers, First Series*, vol. v., ed. by Schaff (New York, 1887); Fisher, *History of Christian Doctrine* (ib., 1896); Bright, *The Age of the Fathers*, vol. ii. (London, 1903); Smith and Wace, *Dictionary of Christian Biography*, article "Pelagius" (ib., 1887).

PELAGIUS. The name of two popes. PELAGIUS I., Pope 555-60. He came of a noble Roman family, and as a deacon accompanied Pope Agapetus I. to Constantinople (536). Pope Vigilius appointed him his representative at the Imperial Court there in 540, and he won great influence over the Emperor Justinian. He took a vigorous part in the controversy over the Three Chapters of Justinian (see CHAPTERS, THE THREE), in which the decree of the Council of Chalcedon on the Person of Christ was constructively condemned. Despite his opposition to the Emperor's views, the latter, on the death of Vigilius, put him forward as his candidate for the vacant see. He was ill received on his return to Italy as the Imperial nominee, and only two bishops came to assist in his consecration. He endeavored to clear himself from the charge of complicity in heresy by a solemn protestation of allegiance to the teaching of the four general councils, and especially that of Chalcedon; but he could not prevent a schism in Northern Italy. He died in Rome, March 3, 560, or, according to Duchesne, March 4, 561. His letters are in Migne, *Patrologia Latina*, lxix; some additional ones in Löwenfeld, *Epistolæ Pontificum Romanorum Inedita* (Leipzig, 1885).—PELAGIUS II., Pope 578-90, born in Rome of a Catholic family. He was elected Pope when Rome was besieged by the Lombards, and appealed to the Greek Emperor Tiberius II. for assistance; but that monarch was too much occupied with a war in Persia. He then turned to the Franks, with whom Maurice, the successor of Tiberius, concluded a treaty. The Franks, however, proved untrustworthy allies, and the troubles of Italy continued. He took great offense at the toleration of the title 'universal bishop' by John the Faster, Patriarch of Constantinople, and forbade his representative there to attend any service celebrated by John.

But his heart was gladdened at the end of his pontificate by the news that the West-Goths in Spain had returned from Arianism to the orthodox faith (589). He died of the plague in Rome, February 7, 590. His letters are in Migne, *Patrologia Latina*, lxxii. He was succeeded by Gregory the Great, who had long been his trusted counselor, and in whose biographies many of the events of his pontificate will be found; consult also Weise, *Italien und die Langobardenherrscher* (Halle, 1887).

PEL'AGOSAU'RUS (Neo-Lat., from Gk. *πέλαγος*, *pelagos*, open sea + *σαῦρος*, *sauros*, lizard). An extinct Liassic crocodile, found fossil in Southern Germany, in France, and in England, having a peculiarly elongated narrow skull and jaws furnished with many sharp, slender teeth. See CROCODILE.

PELARGONIC ACID, $C_9H_{18}O_2$. One of the so-called *fatty* acids. It is an oily liquid, nearly insoluble in water, but soluble in alcohol and ether. It derives its name from its having been originally obtained from the leaves of *Pelargonium roseum* by distilling them with water. It may also be obtained by the oxidation of oil of rue with nitric acid. It is supposed to exist in a combined form in old whisky.

PELARGONIUM (Neo-Lat., from Gk. *πέλαργος*, *pelargos*, stork; so called from the resemblance of the capsules to a stork's bill). A genus of plants of the natural order Geraniaceæ, including many favorite greenhouse and house plants, to some of which the old generic name Geranium (q.v.) is popularly given. The genus contains about 170 species, smooth or downy perennial herbs or undershrubs, native chiefly of South Africa, a few species being found in Australia. The species in cultivation have become so modified that it is often difficult to determine their origin. The leaves exhibit great variety in form,

A CULTIVATED VARIETY OF PELARGONIUM.

texture, fragrance, and color. The flowers always adhere to a certain type in form, but vary greatly in color and size; they are always in stalked umbels, arising from the axils of the leaves, or in the stemless kinds from the midst of the leaves. In no genus has the art of the gardener produced more striking results than in this; and the number of beautiful hybrids and varieties is very great, some of them excelling in beauty any of the original species. Some species, not possessing much beauty of flower, are cultivated for the grateful odor of their leaves. The cultivated species are divided into four groups, namely, ivy geraniums, derived from *Pelargonium peltatum*; scarlet, horseshoe, or zonal geraniums, from *Pelargonium zonale* and *P. inquinans*; Lady Washington geraniums; and rose geraniums. The horseshoe geraniums often have a horseshoe-shaped dark zone on the leaf. The flowers of the Lady Washington varieties are very large and irregular, while the rose-colored or purple flowers of the rose geraniums are rather small. These last two groups each include a number of different species. Most of the common varieties are largely grown as bed and border plants, their outdoor culture being quite simple. For this purpose the plants are taken from the greenhouse after danger of frost has passed and set out in a well-worked, rich, sandy loam. Water must be liberally supplied during the time of flowering; but for no plants is a period of rest more necessary, and water must then be very sparingly given. Many of the shrubby kinds may be trimmed of leaves and watery shoots, hung up by the roots in a dry cellar, or covered with hay in a box, in a cool but frost-proof dry loft or garret. Another method is to cut off every leaf before frost comes, and to keep the plants all winter in their pots in a dry, cool room, without watering them. By such means many varieties are successfully cultivated by persons who have no greenhouse. Pelargoniums are commonly propagated by cuttings from the firm shoots, which root readily.

PELASGIAN ARCHITECTURE. See CYCLOPEAN ARCHITECTURE.

PELAS'GIANS (Lat. *Pelasgi*, from Gk. *Πελασγοί*, *Pelasgoi*, of uncertain etymology). The name of a people dwelling in Greece in early times, used with very different meanings at different times. In the earliest Greek writings, the Homeric poems, the Pelasgians seem to be the inhabitants of Pelasgian Argos and the fertile valley of the Peneus around Larissa in Thessaly, and the Zeus of Dodona is also called Pelasgian. In a somewhat late part of the *Iliad* they appear among the allies of the Trojans, thereby causing much trouble to ancient and modern commentators. As there is no other trace of their existence in Asia Minor, very possibly the poet, knowing of enmity between the Achæans of Phthiotis and their northern neighbors, thought of the latter as coming from Thessaly to Troy. In the *Odyssey* they are once mentioned as one of the tribes in Crete. Nothing in the epic indicates that they are of other race than the Greeks. Like the other tribes of Thessaly, they seem to have been conquered by the Thessalians, and probably largely reduced to Penestæ, though their old territory was known in historical times as Pelasgiotis. Tradition, however, told of the former state of their King, Pelasgus, son of the earth. This seems the slender basis on which the extensive and contradictory legend of the Pelasgians grew up. In Hesiod we find Pelasgus transferred to Arcadia, whose people also claimed to be autochthones, though it must be said that Pelasgians do not appear as a race in any early Arcadian legend. The epithet Pelasgian was transferred to Argos in Peloponnesus, and now we find there also a King Pelasgus prepared to receive Danaus and his daughters. Herodotus has decided that the old name of Greece was Pelasgia, and that the Pelasgians preceded the Hellenes; naturally, since Hellenes could not well exist before Hellen and his three sons, while many Greek genealogies traced descent from different sources. Further confu-

sion was invited by the transformation of the Athenian name for the old fortification of the Acropolis, *Pelargicon*, into Pelasgicon; whence it followed that Pelasgians had lived in Attica. Moreover, Hecataeus, who seems to have made this transformation, also identified the Tyrrhenians of Lemnos with Pelasgians, and brought them from Attica to the island. As the Etruscans were also Tyrrhenians, it followed that they were Pelasgians, and so the race appeared in Italy. This identification also converted Pelasgians into barbarians, for every one knew that the Tyrrhenians were not Greek. Thus toward the end of the fifth century B.C., apparently by Hellanicus, the legend was fully developed that they were the original inhabitants of Greece, driven from Peloponnesus to Thessaly by the Danaans, and scattered to the four winds by the Hellenes. It has been well said that in general the Pelasgians only appear in a land in order to be driven out. From this conception of the Pelasgians naturally arose the theory that to them were due the great works of the early days, and the mighty walls that some called Cyclopean were by others termed Pelasgian. In recent years it has become very common to employ the term Pelasgian to designate the pre-Aryan population of Greece and Italy, to whom is attributed the pre-Mycenæan civilization; not, of course, with the implication that this population formed one great people, but rather as a convenient collective name for more or less closely related tribes. This use may be criticised as easily leading to the belief that it rests on ancient authority, and not on modern speculation. Of late they have been brought into special prominence by the theory that to them is due the entire Mycenæan civilization; that they were invaded and conquered by the Achæans, a fair-haired tribe akin to the Celts, who became a ruling class, and to whom is due the Homeric civilization. The dark-haired Pelasgians gradually absorbed their conquerors, as has been the case in other invasions of these lands by blond northern races. The theory uses largely, if uncritically, the ancient authorities, but has not won general acceptance.

The literature on this question is very voluminous. The more important discussions, to 1889, are collected in Hermann's *Lehrbuch der griechischen Antiquitäten*, 6th ed. by Thumser (Freiburg, 1889). Consult also Busolt, *Griechische Geschichte*, i. (2d ed., Gotha, 1893). For the ancient statements, consult S. Bruck, *Quæ Veterum de Pelasgis Tradiderint* (Breslau, 1884), and especially the thorough examination by E. Meyer in his *Forschungen zur alten Geschichte*, i. (Halle, 1892), who has shown how largely they consist of guesses. The new theory is presented in Ridgeway's *Early Age of Greece* (Cambridge, 1901 et seq.). It is discussed in Hall's *Oldest Civilization of Greece* (London and Philadelphia, 1901), and by J. C. Myres, in *Classical Review*, vol. xvi. (London, 1902).

PELAYO, pā-lī'yō (died 737). The first Christian King in Asturias, after the conquest of Spain by the Arabs. Practically nothing is known about his life. He was, strictly speaking, nothing but a robber chieftain; still by his defense of Covadonga, a mountain fastness, in 718 against the Moslems, he kindled the national spirit and became the founder of the Spanish monarchy. The legend states that at Covadonga he and thirty followers destroyed an Arab army four hundred thousand strong. Consult Burke, *A History of Spain*, vol. i. (London, 1895).

PELECYP'ODA (Neo-Lat. nom. pl., from πέλεκυς, *pelekys*, axe + πούς, *pous*, foot), or LAMELLIBRANCHIATA, or BIVALVES. A class of bilaterally symmetrical acephalous mollusks, all of which have bivalve shells, and gills in the form of vascular plates of membrane attached to the inner surface of the mantle. The body is very strongly compressed, the dorso-ventral diameter being much greater than the lateral. The *adductor* muscle, which closes the shell, is single in some, double in the greater number. The shell is naturally more or less open, owing to the peculiar elastic hinge which tends to keep it open. But the adductor muscles continually tend to close it. Consequently when a live mollusk is irritated the shell closes tight, but when the animal is dead the muscles relax and the shell gapes open. Important differences exist in the powers of locomotion. Oysters are fixed to one spot by one of the valves of the shell; but most of the pelecypods have the power of moving by swimming, leaping, or burrowing in sand, sometimes in more than one of these ways, being provided for this purpose with a fleshy muscular organ called the *foot*. Some, as mussels, fix themselves when young by a cable of chitinous threads, the *byssus*. The mouth is jawless and toothless, but on each side are two flaps, the labial palpi. All seem to depend for their food on the currents of water continually brought by ciliary action into the mouth. The edges of the mantles are sometimes entirely separate from each other, but are often more or less fused. In the latter case two openings are left in the posterior edge, through the lower of which water is brought into the mantle cavity, where, having been deprived of its oxygen by flowing over the gills, and of its nutritive material in the stomach, it passes out through the upper opening, carrying away the waste, and, at the proper season, the reproductive elements. Various modifications of this inhalent and exhalent apparatus exist; and in many forms the orifices become elongated into two tubes called 'siphons,' which, as in the clam, may often be extended several inches beyond the shell. Bivalves, with such siphons, live buried in mud or sand with only their siphons reaching the surface. The edges of the mantle often bear tentacles, papillæ, glands, and more or less complicated eyes. The two halves of the shell are usually of about the same size, but in some forms one valve is very much larger than the other. Generally the shell covers the whole animal, and when the shell is closed the animal is completely shut in, but in the shipworm (q.v.) the two halves of the shell are very small, and inclose only an insignificant part of the greatly elongated body.

The ear or otocyst is situated in the 'foot.' The heart is three-chambered, there being two auricles and one ventricle. The sexes exist in different individuals. The number of eggs is usually enormous, the oyster producing about two millions each season. The young pelecypod passes through a free-swimming veliger stage, and some bivalves get their growth in a single year. The fresh-water mussels live from ten to twelve years, while the giant clam (Tridacna) is supposed to attain an age of from sixty to one hundred years. Many bivalves are of great use to man as food, notably oysters, clams, and scallops. Others, as

the ship-worm (q.v.), are injurious. The mollusks of this class vary in size from a small fraction of an inch up to the giant clam (q.v.) of the East Indies, which reaches three feet in length. In many species the shells are very beautiful, the interior being lined with nacre, or mother of pearl. Pearls (q.v.) are formed in many, especially in the pearl oyster and fresh-water mussels. Bivalves inhabit all parts of the world in both salt and fresh water, and form a highly important part of the food of many valuable fishes, especially those of the cod family, as well as of other marine animals. About 14,000 species are known, 8000 or 9000 of which are fossils; and they are generally grouped in five orders, distinguished by the character of the gills.

See MOLLUSCA; MOLLUSK and authorities cited thereunder; Colored Plate of CLAMS AND EDIBLE MUSSELS and Plate of ABALONE, ETC.

PELÉE, pā-lā', MONT (or more properly, MONTAGNE PELÉE). An active volcano of the island of Martinique, situated in its northwestern part, in about latitude 14° 48′ N. The elevation of the Morne de La Croix (the culminating point at the time) previous to May, 1902, was about 4300 feet; of the newly formed cone, with its extended 'plug' or obelisk, in May, 1903, 5200 feet. The mountain has exceedingly gradual slopes, which rise with gradients of from five to twenty-five degrees, and is constructed of alternating lava-masses (andesite) and fragmental agglomerates. Its surface is scarred by deep ravines and waterways, the latter numbering about twenty-five, the majority of the streams taking individual courses to the sea. Among the most noted of these are the Rivière Blanche (lying in the course of the devastated region), the Rivières Prêcheur, Grande, Basse-Pointe, Falaise, and Roxelane, the last-named flowing through the town of Saint Pierre. Prior to the eruption of May 8, 1902, a small tarn, the Lac des Palmistes—often, but probably erroneously, referred to as a crater-lake—occupied the flattened summit of the volcano, and was surrounded by beautiful and rank vegetation. The only historically recorded eruptions of Mont Pelée are those of 1762, August, 1851, and 1902-03 (those of May 8, 20, 26, June 6, July 9, and August 30, 1902, being especially accentuated), all having taken place from craterlets or soufrières located on the western and southwestern slopes of the mountain, and at elevations of from 2400 to 3000 feet. The great eruptions of 1902 were from the basin of the Etang Sec, or 'Dry Lake,' near the head of the Rivière Blanche, this being the true crater, a wild basin, about a half mile in greatest diameter, surrounded in greater part by rugged walls of rock 1600 feet or more in height. The seaward face of the Morne de La Croix plunged at an angle of 75° into this crater-basin. The active opening of this crater, the general character of which had been recognized fifty years before, was on April 25, 1902; from it, on May 5th, descended the 'avalanche' of boiling black mud that destroyed the sugar estate (*usine*) of Guérin, and buried beneath its mass thirty or more of the workmen (and proprietors), and on May 8th the black cloud of explosive and exploded superheated steam, charged with glowing incandescent particles, which (at 8.2 A.M.) destroyed Saint Pierre, and with it hardly less than 30,000 people. The phenomena of this remarkable eruption are not yet known in their full detail, but they are among the most extraordinary recorded in the intensity of the associated electric manifestations, the vast disturbance in the magnetic field, and the violence of the destroying blow. The magnetic disturbance was transmitted to the antipodal region of the earth in about two minutes' time, while the noise of the eruption manifested itself forcibly at Maracaibo, Venezuela, and beyond, at a direct distance of 850 miles, or considerably more.

The second death-dealing eruption of Mont Pelée took place on August 30th at about 9 P.M., and destroyed in less or greater part Morne Rouge and Ajoupa-Bouillon, besides inflicting considerable damage, with loss of life, upon Morne Balai, Morne Capot, and Bourdon (Basse-Pointe). The loss of life in this later explosion, whose characteristics appear to have been almost exactly those of the May cataclysm, has been estimated at from 2000 to 2500. Since that date, as well as in the period preceding the early days of May, the volcano has been continuously active, discharging vast quantities of lapilli and ashes. There has been at no time during the recent period of activity any lava flow, although the large ejected blocks or bombs, together with the massive extended obelisk, clearly show the presence of a molten magma within the throat or neck of the volcano. The column of ejected steam, laden with dust and lava bombs, shot forth from the crater on August 30th, just before the second great eruption, was estimated to have a diameter of 1500 feet as it rose over the crest of the crater, and its initial velocity was roughly computed to be in the neighborhood of 100 miles an hour. The steam ascended miles into the air, spreading out into a broad, mushroom-like canopy. The most extraordinary feature that is associated with the activity of Pelée is the giant mass of rock, a veritable obelisk, which has been slowly pushed out through the summit opening of the new cone, and rises (June, 1903) to upward of 800 feet, with a basal thickness of 300-350 feet. The molten lava rises into some portions of this, and may be followed at night-time along the passages, which are made brilliantly red.

It is a remarkable circumstance that, despite the accentuated warnings which for a period of two weeks and more Mont Pelée threw out presaging disaster, only a few hundred of the inhabitants of Saint Pierre took the precaution to leave the city; and this loss to the population was counterbalanced by numbers of refugees who from minor villages and hamlets had flocked to the larger city for protection. The annihilating blow came with appalling swiftness, and there is reason to believe that for the greater part of the 30,000 victims death was well-nigh instantaneous, or, at least, brought about in two to three minutes. Only two of the inhabitants from the city proper appear to have survived their wounds, although a dozen or more lingered on in the hospital of Fort-de-France and elsewhere for a few days. The attitudes and conditions of many of the corpses found among the ruins were largely suggestive of the remains (casts) recovered from Pompeii, and there is reason to believe that the destruction of the two cities may have been brought about in very nearly the same way. In both places many of the bodies were found wholly destitute of clothing or giving indication of having had the clothing swept from the body

by a tornadic blast. For several days preceding the cataclysm Saint Pierre was well covered with ash, and the local journals called attention to the wintry aspect of the city. See MARTINIQUE.

BIBLIOGRAPHY. Berté, "Les éruptions de la Montagne Pelée," in *Geographie*, vol. xvi. (Paris, 1902); Deckert, "Die westindische Vulkankatastrophe und ihre Schauplätze," in *Gesellschaft für Erdkunde Zeitschrift* (Berlin, 1902); Geikie, "The Volcanic Eruptions in the West Indies," in *Pall Mall Magazine*, vol. xxvii. (London, 1902); Hill, "Report on the Volcanic Disturbances in the West Indies," in *National Geographical Magazine*, vol. xiii. (Washington, 1902); Hovey, "Martinique and Saint Vincent," in *American Museum of Natural History Bulletin*, vol. xvi. (New York, 1902); Russell, "Phases of the West Indies Eruptions," in *Century Magazine*, vol. lxiv. (New York, 1902); Lapparent, "L'éruption de la Martinique," in *Revue des Questions Scientifiques*, ser. 3, vol. iii. (Louvain, 1903); Heilprin, *Mont Pelée and the Tragedy of Martinique* (Philadelphia, 1903).

PÉLÉE ISLAND. An island of Lake Erie, belonging to Essex County, Ontario, Canada, about 6 miles northward of the Put-in-Bay group, and 10 miles southwest of Point Pelée on the north shore mainland. It is 9 miles long from north to south, and 4 miles wide at its widest part. More than half the surface is marsh; the remainder is sparsely timbered, and of late years has been considerably occupied with vineyards. Its beaches furnish sand for building purposes.

PE'LEUS (Lat., from Gk. Πηλεύς). In Greek legend, a son of Æacus, King of Ægina, and the nymph Endeïs, and a brother of Telamon. In jealousy he and Telamon brought about the death of their half-brother Phocus, and were banished. He withdrew to Phthia in Southern Thessaly, where Eurytus purified him from blood-guiltiness and gave him his daughter Antigone to wife. While participating in the Calydonian Hunt he had the misfortune to kill his father-in-law accidentally. Once more an exile, he withdrew to Iolcos, where Acastus, son of Pelias, was celebrating magnificent funeral games for his father. In these Peleus took part, but was defeated by Atalanta in wrestling. Here he attracted the notice of Astydameia, wife of Acastus (or, in another version, Hippolyte, daughter of Cretheus), who offered him her love. On his refusal she slandered him to his wife and Acastus. Antigone hanged herself, while Acastus planned the death of Peleus. Rescued by Chiron, the good Centaur, Peleus later returned with Jason and the Dioscuri, destroyed the city, and killed Acastus and his wife. Celebrated in legend was his marriage to the Nereid Thetis, who had been sought by Zeus and Poseidon, but was given to a mortal because of the prophecy that her son would be mightier than his father. Peleus, helped by the gods, lay in wait for her by the shore, and in spite of her transformations into fire, water, and wild beasts, held her fast until she returned to her original form. The marriage was attended by all the gods, who bestowed valuable gifts. Poseidon gave him two immortal horses, and Chiron the ashen spear which Achilles wielded at Troy. Into this gathering Ate threw the golden apple inscribed "For the Fairest," which led to the "Judgment of Paris," and the Trojan War. By Thetis Peleus became the father of Achilles, and in later writers she is said to have returned shortly to her life as a Nereid, while the boy was brought up by Chiron; but this seems unknown to the Homeric poems, though even in the *Iliad* Thetis is represented as dwelling in the sea. Peleus is also said to have been one of the Argonauts and to have accompanied Hercules and Telamon to Troy. The marriage of Peleus and Thetis was described by later poets, and represented on works of art, of which the best known is the celebrated François vase in Florence, made by the Athenians Clitias and Ergotimos, in the sixth century B.C.

PELEW, pē-lōō', or **PALAU,** pä-lou', **ISLANDS.** A group of 26 small islands in the Pacific Ocean lying to the east of the Philippine and to the west of the Caroline islands, between the parallels of 7° and 8° N., and the meridians of 134° and 134° 45' E. (Map: East Indies, H 3). They were discovered by the Spaniards in 1545 and remained in their possession until 1899, when they were purchased by Germany along with the rest of the 680 islands of Micronesia (except Guam), and now form part of the German "New Guinea Protectorate." Area, 170 square miles. The largest and most populous member of the group is Babelthuat; the most important politically is Korror, where the King resides. The southern islands are coral in origin, the northern volcanic. The surface is rugged and hilly and covered with forests. The soil is fertile and the vegetation tropical. The climate is equable and salubrious, the temperature ranging from 77° to 91° F. Rice is the principal food of the people; sugar-cane, tobacco, breadfruit, cocoanuts, bananas, lemons, oranges, and other tropical fruits are grown. Only six of the islands are inhabited. Pililu, one of the southern islands, probably gives name to the group. The natives of the Pelew Islands are of Malayo-Polynesian race, with, according to some authorities, a trace of Papuan blood. They are still among the most primitive and good-natured of the peoples of the Pacific, and are of considerable interest to ethnologists by reason of their marriage customs and other social institutions. These have been studied by Kubary in *Die sozialen Einrichtungen der Palauer* (Berlin, 1885).

PELHAM, pē'ăm, PETER (1684 or 1694-1751). An English mezzotint engraver, born probably at Chichester. His earliest plate is dated 1720. His subjects include: George I., George II., and Queen Anne, after Kneller; Peter Paul Reubens, after Reubens; Oliver Cromwell, after Walker. In 1726 he went to America and settled in Boston, where he opened a school in which he taught painting, reading, writing, dancing, and needlework, meanwhile keeping up his engraving. His portrait of Cotton Mather (1727) was the first of its kind ever produced in America. Other subjects treated by him include: Rev. John Moorhead (1731), Rev. Mather Byles, his own originals; Benjamin Coleman (1734), Rev. William Cooper (1743), Rev. Joseph Sewall, and Governor Shirley (1747), all after Smibert; plan of the city and fortress of Louisburg, after Richard Gridley (1746); Rev. Charles Brockwell, Rev. Thomas Prince (1750), Thomas Hollis (1751), and Rev. Edward Holyoke (1749), after Highmore. Pelham was the first master of John Singleton Copley, the painter.

PELHAM-HOLLES, hŏlz, Thomas, First Duke of Newcastle. See Newcastle, Thomas Pelham-Holles, First Duke of.

PELHAM, OR THE ADVENTURES OF A GENTLEMAN. A novel by Bulwer-Lytton (1828). The hero, though a dandy, is a young man of serious ambition, who devotes himself to politics. His love for Ellen Glanville induces him to take steps to prove the innocence of her brother, who was accused of murder, though at first convinced of his guilt.

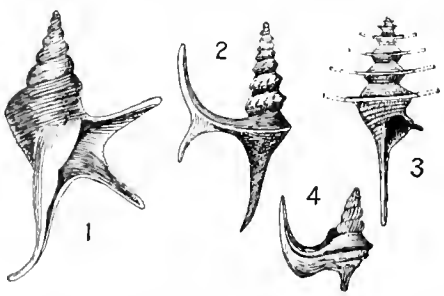
PE'LIAS (Lat., from Gk. Πελίας). In Greek legend, a son of Poseidon and of Tyro, daughter of Salmoneus, and twin brother of Nelens, father of Nestor. With his brother he was exposed by Tyro, but the children were found and reared by a herdsman, who named him Pelias (compare πελός, *pelos*, dark-colored) because his face was livid from a kick by a mare. In the meantime Tyro had become the wife of Cretheus, King of Iolcos in Thessaly, and mother of Æson, Pheres, and Amythaon. The twins later found their mother, and after Cretheus's death Pelias succeeded in seizing the throne from Æson, who fled into exile. By his wife, Anaxibia, daughter of Bias, he became father of Acastus and four daughters. One of these was Alcestis, who was won by Admetus, who met the test imposed by her father, by harnessing a lion and a boar to a chariot. Jealous of Jason, his nephew, Pelias dispatched him to secure the Golden Fleece at Colchis. On the return of the *Argo*, Medea persuaded the daughters of Pelias that she could rejuvenate their father, by boiling his flesh with magic herbs. They accordingly killed and cut up the old man, but were then mocked by Medea, who thus revenged the wrongs of her husband, Jason. His funeral was celebrated with great splendor by Acastus, and the games were a favorite theme with ancient poets. See Argonauts; Medea.

PELICAN (AS. *pellican*, from Lat. *pelicanus*, *pelecanus*, from Gk. πελεκάν, *pelekan*, pelican, connected with πελεκᾶς, *pelekas*, woodpecker, from *pelekan*, to hew with an axe, from πέλεκυς, *pelekys*, Skt. *parasu*, axe). A large web-footed, fish-eating water-bird of the family Pelecanidæ, having a very large, long, flattened bill. The upper mandible, which is terminated by a strong hook, curves over the tip of the lower one; and beneath the lower mandible, which is composed of two flexible bony branches meeting at the tip, a large distensible pouch of naked skin is appended. The tongue is very short and almost rudimentary; the face and throat generally are naked; the wings of moderate length, the tail rounded. About 12 species are known, widely distributed in warm regions, frequenting the shores of the sea, lakes, and rivers, and feeding chiefly on fish. They take their prey by plunging upon it into the water, and store it in their pouch, for their own eating at leisure or to feed their young. Three species of pelican occur in the United States. The white pelican (*Pelecanus erythrorhynchus*) was formerly found throughout North America, but is now rare east of the Mississippi, except along the Gulf coast, where it winters. It resembles the common pelican of the Old World, but differs in having a curious horny prominence on the bill during the breeding season. The plumage is pure white, excepting the primaries. It is the largest American species, being five feet long and eight or nine feet across the wings. It breeds in colonies generally; the eggs, from one to four in number, are creamy or bluish white, 3½ inches long by 2¼ broad. The brown pelican (*Pelecanus fuscus*) is somewhat smaller than the white pelican, and gray and brown. It is found throughout the West Indies, occurs as far north as South Carolina, and breeds throughout its range. The brown pelican of the California coast (*Pelecanus Californicus*) is a trifle larger and shows more difference in color.

The common pelican of the Old World (*Pelecanus onocrotalus*) is as large as a swan. Its plumage is white, tinged with flesh color. It is a native of Eastern Europe, and of many parts of Asia and Africa, and frequents both the seacoast and rivers and lakes. It makes a nest of grass on the ground near the water, and lays two or three white eggs. The parents are said to carry water to their young, as well as food, in their pouches. The nail or hook which terminates the bill is red, and it has been suggested that the ancient fable of the pelican feeding its young with blood from its own breast originated from its habit of pressing the bill upon the breast, when the red tip might be mistaken for blood.

In heraldry, the pelican is drawn with her wings indorsed, and wounding her breast with her beak. When represented in her nest feeding her young with her blood, she is called 'a pelican in her piety.' This is connected with the fable above mentioned, and with the symbolism of the pelican in mediæval religious art as significant of self-sacrifice. Consult Twining, *Symbols and Emblems of Christian Art* (London, 1886). See Plate of Fishing Birds.

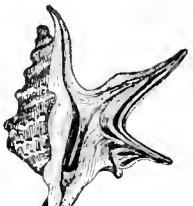
PELICAN'S-FOOT, or Spout-Shell. A shell of a gastropod of the family Aporrhaidæ, of which



FOSSIL APORRHAIDÆ.

1, *Alaria myurus* (lower Oolite); 2, *Anchura carinata*; 3, *Spanigera semicarinata* (Jurassic); 4, *Aporrhais calcarata* (upper Greensand).

but four living species remain, but a great number of quaintly shaped fossil species are known from the Jura onward. The most common specimens are of *Aporrhais pes-pelicani*, numerous on the Western European coast. Its widely distended and prolonged outer lips account for its popular name. A heavier, less forked species (*Aporrhais occidentalis*) is occasionally seen off New England. These mollusks inhabit rather deep water, and their habits are little known.



PELICAN'S-FOOT SHELL.

PELICAN STATE. Louisiana. See STATES, POPULAR NAMES OF.

PE'LION (Lat., from Gk. Πήλιον). A wooded mountain range on the coast of Thessaly, southeast of Ossa. The chief summit, now called Plessidi, is 5308 feet high, and in ancient times was a seat of the worship of Zeus Aeræus. The mountain is still thickly wooded with oak, chestnut, and beech. In ancient legend it played an important part as the home of the Centaurs, and especially of the good Chiron, whose cave was shown in later times. Otus and Ephialtes in their attempt to scale heaven were said to have piled Ossa on Olympus and Pelion upon Ossa, or, according to Vergil, Ossa on Pelion, and Olympus upon Ossa.

PÉLISSIER, pā'lē'syā', AIMABLE JEAN JACQUES, Duke of Malakoff (1794-1864). A marshal of France, born at Maromme, near Rouen. He studied at the artillery school of La Flèche and at Saint-Cyr, from which he entered the artillery of the Royal Guard in 1815. He served in Spain in 1823, made the campaign of the Morea in 1828, joined the first expedition to Algiers in 1830, and in 1839 returned to Algeria with the rank of lieutenant-colonel. He commanded the left wing of the French army at the battle of Isly (1844). In 1845 he acquired an unenviable notoriety by putting to death by suffocation some six hundred Arabs who took refuge in the caves of the Dahra and refused to surrender. Marshal Soult, then Minister of War, did not venture to approve this atrocity, but Marshal Bugeaud, commander-in-chief in Algeria, declared that Pélissier only carried out his positive orders, and so saved his subordinate from disgrace. By 1850 Pélissier had attained the rank of general of division. When the news of the coup d'état of December 2, 1851, reached Algeria, he espoused the cause of the Emperor, and placed the province under martial law until order was restored. In the Crimean War he was given command of the First Army Corps, and early in 1855 he succeeded Marshal Canrobert in the chief command. After the fall of Sebastopol Pélissier received a marshal's baton, and on his return to France was created Duke of Malakoff and a Senator. He was also made a member of the Order of the Bath by Queen Victoria. In 1858 he went to London as French Ambassador, but resigned in the following year a post for which he had little relish. He was then named Governor-General of Algeria, and died at Algiers May 22, 1864.

PELL, JOHN (1611-85). An English mathematician, born at Southwick, in Sussex. He was educated at Steyning and at Trinity College, Cambridge. He was a remarkable student, having at the age of twenty mastered Hebrew, Greek, Latin, Arabic, Italian, French, Spanish, and Dutch, and having shown much proficiency in mathematics. He was elected to the chair of mathematics at Amsterdam in 1643. By the invitation of the Prince of Orange (1646), he accepted the professorship of mathematics at Breda. He returned to England a few years later (1652), and was made political agent to the Protestant cantons in Switzerland by Cromwell in 1654. Returning again to England in 1658, he entered the ministry (1661), and became rector of Fobbing and vicar of Laindon, both in Sussex County, which offices he retained till his death. He was chosen Fellow of the Royal Society in 1663, and in the same year became domestic chaplain to Dr. Sheldon, Bishop of Canterbury, and took the degree of doctor of divinity. But his interest in philosophy and mathematics unfitted him for the ministry, leading him to neglect his clerical duties in pursuit of more congenial studies. Pell was influential in the matter of fixing the symbolism of algebra. The division symbol ÷ is commonly attributed to him, although it was due to Rahn, whose work, translated by Brancker, he edited (1688). His most important mathematical works are: *A Refutation of Longomontanus's Pretended Quadrature of the Circle* (1646, in Latin 1647); *A Table of 10,000 Square Numbers* (1672); *An Antilogarithmic Table*, computed with the aid of Walter Warner (c.1630-40), now lost; and a collection of some 40 folio volumes of letters and papers preserved in the British Museum.

PEL'LA (Lat., from Gk. Πέλλα). An ancient city, situated in the southeastern part of Macedonia, on the river Ludias, which formed around it impassable marshes, the present Lake of Janitza. It is mentioned in Herodotus, and at the end of the fifth century B.C. was the capital of King Archelaus. It first grew to a town of importance under Philip II., and became celebrated as the birthplace of Alexander the Great. It was the capital of the Macedonian kings from Antigonus Gonatas to Perseus, and in its acropolis they kept their treasure. By the Romans it was made a colony and seems to have enjoyed some prosperity, but under the later Empire gradually declined. The name seems to have clung to a spring not far from Janitza, and the ruins of the town are to be found at the neighboring Palatitza, where parts of a large palace have been excavated. Consult Heuzey and Daumet, *Mission archéologique en Macédoine* (Paris, 1876).

PEL'LAGRA (Neo-Lat., from Lat. *pellis*, skin + Gk. ἄγρα, *agra*, a catching, chase). A severe and chronic disease due to eating altered maize. It occurs extensively in the northern parts of Italy (whence it has been called Alpine scurvy or Italian leprosy), Spain, the south of France, and other parts of Europe. It has never been observed in America. The disease is generally confined to the poorer classes, especially of the country districts, and is worse in times of famine, when diseased or fermented maize is the chief article of diet. The trouble begins with indefinite digestive disturbances, with insomnia, but as it progresses there occurs an eruption on the skin followed by suppuration and the formation of dark crusts; the digestive symptoms become worse, with salivation, dyspepsia, and diarrhœa. In the more severe forms of the affection there are pronounced nervous phenomena —headache, backache, spasms, and paralyses. The mental depression is profound—melancholia and suicidal mania being common. The extent of the ravages of this affection may be estimated from the fact that of 500 patients in the Milan lunatic asylum in 1827 one-third were afflicted with pellagra; that in 1784 one out of every twenty and in 1817 one out of every five or six of the population presented symptoms of the disease. Treatment resolves itself into a correction of diet and removal from the infected district. For an elaborate discussion of the subject, see Jules Arnould, in the *Dictionnaire Ency-*

clopédique des Sciences Médicales, vol. xxii. (Paris, 1886); also the official report, *La pellagra in Italia* (Rome, 1880).

PELLAT, pā'lâ', JOSEPH SOLANGE HENRI (1850—). A French physicist, born at Grenoble. He studied in Paris at the Ecole Normale Supérieure, was assistant in physics at the Paris Observatory (1874), and taught in various lycées until 1893, when he was named adjunct in the scientific faculty of the University of Paris. In 1899 he was promoted to a full professorship. Pellat's especial field of research is electricity. On thermodynamics also he wrote for the *Journal de Physique* and the *Comptes Rendus*. He invented an electrodynamometer balance, and other apparatus for the measure of specific inductivity; and wrote: *Cours de physique* (1883-86); *Electricité atmosphérique* (1890); and *Cours de physique générale* (1896-97).

PELLEGRINO, pēl'lâ-grē'nō, TIBALDI. See TIBALDI, PELLEGRINO.

PELLETAN, pēl'tăN', CHARLES CAMILLE (1846—). A French politician, son of the following. He was born in Paris, studied at the Ecole des Chartes, and entered the political press with boldly republican attacks on the Empire. He became editor-in-chief of *La Justice* in 1880 and in the following year was elected to the Chamber of Deputies, where he voted with the Radical Left. He was an active opponent of Boulanger. In 1902 he received in the Combes Cabinet the portfolio of the navy and came near causing international complications because of his ill-advised speeches in which he foreshadowed a great war of conquest for France. His publications include: *Le théâtre de Versailles* (1876), a collection of his reports on the meetings of the National Assembly; *Question d'histoire: Le comité central et la Commune* (1879); *Georges Clémenceau* (1883); *Les guerres de la Révolution* (new ed., 1891); and *De 1815 à nos jours* (1892).

PELLETAN, PIERRE CLÉMENT EUGÈNE (1813-84). A French politician and publicist, born at Royan. He was educated at Poitiers and Paris, was engaged in journalistic work in the latter city from 1837, and incurred the displeasure of the Government by the freedom with which he voiced his political convictions. In 1868 he became chief editor of the *Tribune*, of which he had been a founder, and in 1863 he was elected to the Chamber of Deputies, where he sided with the opposition. During the Franco-Prussian War he was a member of the Government for National Defense; in 1871 he was elected to the National Assembly and in 1876 to the Senate. Three years afterwards he became vice-president of the Senate. He was the author of *La lampe éteinte* (1840); *L'histoire du brahmanisme* (1846); *La loi de progrès* (1857); *Decadence de la monarchie française* (1860); *La nouvelle Babylone* (1863); *Elisée: voyage d'un homme à la recherche de lui-même* (1877); and *Dieu est-il mort?* (1883). The friendship between Lamartine and himself was dissolved by the publication of Pelletan's *Profession de foi du XIXme siècle* and *Lettres à un homme tombé* (1857).

PELLETIER, pēl-tyā'. Sir CHARLES ALPHONSE PANTALÉON (1837—). A Canadian statesman, born at Rivière Ouelle, Quebec Province. He was educated in the Sainte Anne de la Pocatière College and Laval University, called to the bar in 1860, and became Queen's Counsel in 1879. He commanded the Ninth Battalion of the Voltigeurs de Quebec in the Fenian Raid of 1866, represented Kamouraska in the Dominion Parliament in 1869-77, and Quebec East in the Provincial House in 1873-74. He was made a Senator in 1877, served as Minister of Agriculture in 1877-78, and president of the Canadian commission at the Paris Exposition in 1878. He was made Speaker of the Senate in 1896, and was knighted in 1898.

PELLEW, pēl'ōō, EDWARD. See EXMOUTH, VISCOUNT.

PEL'LICA'NUS (Neo-Lat., skinner, furrier, from Lat. *pellis*, skin: a translation of his German name, *Kürschner*), CONRAD (1478-1556). A Swiss linguist and reformer. He was born at Ruffach in Alsace, studied for a short time at Heidelberg, entered a Franciscan monastery in his native town, and was later transferred to Tübingen. Subsequently he became professor at Basel. He gradually shifted toward Protestantism, and in 1526 threw aside his cowl and in the following year became professor of Hebrew at Zurich. He published the first Hebrew grammar written in a European language (1504; reprinted in phototype, 1877); his other works are an autobiography (published in Latin at Basel, 1877, and in German, Strassburg, 1891); and a biblical commentary in seven volumes (1532-39). Consult Reuss, *Konrad Pellicanus* (Strassburg, 1893).

PELLICO, pēl'lē-kō, SILVIO (1788-1854). An Italian poet, celebrated for his long and cruel imprisonment by the Austrians. He was born June 24, 1788, at Saluzzo, in Piedmont. In his sixteenth year he went to Lyons, where he stayed, giving his time mostly to French literature, until Foscolo's *Carme de' sepolcri* awakened in him a strong patriotic feeling, and an irresistible longing to return to Italy. About 1810 he went with his family to Milan, where he was professor of French in the Collegio degli Orfani Militari, and he also served as tutor in the family of Count Porro, in whose house the most distinguished men in Milan were wont to meet. His tragedy *Francesca da Rimini* (1818) shows how a mediæval theme may be classically handled. This play is full of lyric passages and of declamation. Pellico took an active part in a liberal periodical called *Il Conciliatore*, which was suppressed. For belonging to the Carbonari (q.v.) Pellico was arrested in 1820, and sent to the Prison of Santa Margherita, at Milan, where his friend the poet Maroncelli was also confined. In the beginning of the following year he was taken to Venice, and in January, 1822, to the prison on the isle of San Michele, near Venice. Maroncelli and he were at last condemned to death; but the Emperor commuted the sentence to twenty years' imprisonment for Maroncelli, and fifteen years for Pellico. In March, 1822, they were both conveyed to the subterranean dungeons of the Spielberg, near Brünn, in Moravia. In August, 1830, however, they were set at liberty. Pellico published an account of his sufferings during his ten years' imprisonment, under the title *Le mie prigioni* (1832). Pellico's health, however, was permanently injured. The Marchioness of Barolo received him into her house at Turin as her secretary. He died at Turin, January 31, 1854. Pellico wrote some twelve tragedies, only

eight of which he published, and nearly all of which deal with mediæval subjects. *Francesca da Rimini* is the last of them and is still a popular play. The verse novels and lyrics (*Poesie inedite di Silvio Pellico*, Turin, 1837) and the *Poesie* (Florence, 1869) belong chiefly to the period between 1834 and 1837. Pellico is shallow and sentimental, but his piety is sincere. His correspondence (*Epistolario*, Florence, 1856, and later editions, 1858, 1861, 1874, 1877) reveals his tendency to mystical contemplation. His fame rests on his account of his imprisonment. *Le mie prigioni* has been translated into many languages. Consult: Bourbon, *Silvio Pellico, sa vie et sa mort* (Paris, 1879); Rinieri, *Della vita e delle opere di Silvio Pellico* (Turin, 1899-1901).

PELLISOV, pĕl'lĕ-zôf, EMIL. The pseudonym of the German physicist Karl Franz Emil Schafhäutl (q.v.).

PELMATAZOA. A class of echinoderms characterized by the fact that (with a few exceptions) they are fixed in their dwelling-place by stalks. It includes the crinoids, cystoids, and blastoids. (See CRINOIDEA; PENTREMITES.)

PELLITORY OF SPAIN, *Anacyclus Pyrethrum*. A plant of the natural order Compositæ. Its small spindle-shaped, fleshy, acrid root has been used medicinally in parts of Europe and still is in Northern Africa, where the plant is native.

PELOP'IDAS (Lat., from Gk. Πελοπίδας) (?-B.C. 364). A Theban general and patriot, the associate of Epaminondas. He belonged to a good family and was in affluent circumstances. In B.C. 382 he was driven from Thebes by the oligarchic party, supported by the Spartans, and took refuge at Athens, but returned with a few associates in B.C. 379, recovered possession of the Cadmeia, or citadel, slew the Spartan leader, Leontiades, with his own hand, and established a democratic form of government. From this time until his death he was actively engaged in fighting for his country's cause, and was successful in several conflicts with the Lacedæmonians. His Sacred Band of Theban youth largely contributed to the victory of Epaminondas at Leuctra (B.C. 371), but failed in a subsequent attack on Sparta itself. In the expedition of the Thebans against the cruel tyrant Alexander of Pheræ (B.C. 368) he was, after several important successes, treacherously taken prisoner, when in the character of an ambassador, but was rescued by Epaminondas in the expedition of the following year. He was then sent to Susa as ambassador from Thebes, and successfully counteracted the Spartan and Athenian intrigues at the Court of Persia. In B.C. 364 he defeated Alexander of Pheræ at Cynoscephalæ, but was himself killed while rushing in pursuit of the enemy. Consult Plutarch's *Life of Pelopidas*, and the standard histories of Greece.

PELOPONNESIAN WAR. See GREECE.

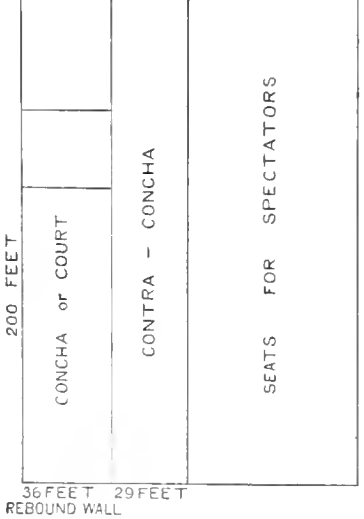
PEL'OPONNE'SUS (Lat., from Gk. Πελοπόννησος, island of Pelops, from Πέλοψ, *Pelops*, Pelops + νῆσος, *nēsos*, island). The ancient name of the peninsula forming the southern part of ancient Greece; now called the Morea (q.v.). It is separated from the mainland by the Corinthian and Saronic gulfs, and united with it only by the narrow Isthmus of Corinth. It was divided into six districts: Argolis, on the northeast; Laconia, on the southeast; Messenia, on the southwest; Elis, on the west; Achæa, on the north; and Arcadia, in the centre. The most famous cities were Mycenæ, Sicyon, Tiryns, Corinth, Argos, Trœzen, and Epidaurus in Argolis, Sparta in Laconia, Messene, Pylos, and Methone in Messenia, Elis in Elis, Patræ and Ægium in Achæa, and Tegea, Mantinea, and Megalopolis in Arcadia. After the conquest by the Dorians a long period of war resulted in the establishment of the supremacy of Sparta, which was maintained until the battle of Leuctra (B.C. 371), which was followed by the Theban invasion under Epaminondas, the restoration of the Messenians, and the founding of Megalopolis. From this time the Peloponnesus was the scene of internal strife until the Roman conquest (B.C. 146), when it became part of the Province of Achaia. Consult: Leake, *Travels in the Morea* (London, 1830); id., *Peloponnesiaca* (ib., 1846); Blouet, *Expédition scientifique de Morée* (and Atlas, Paris, 1831-38); Curtius, *Peloponnesos* (Gotha, 1851-52), still a standard work; Philippson, *Der Peloponnes* (Berlin, 1892), treats chiefly of the physical geography and geology. See GREECE, section on *History*; MOREA.

PE'LOPS (Lat., from Gk. Πέλοψ). In Greek legend, the son of Tantalus, King of Phrygia. His father was especially loved of the gods, but at a feast at which they were present he slew and served to them his son. The gods, recognizing the nature of the food, refused it, with the exception of Demeter, who, absorbed in grief at the loss of her daughter, devoured a shoulder. At the command of Zeus, Hermes threw the members into a caldron from which Clotho drew the boy restored to life, while Demeter replaced the lost shoulder by one of ivory. Later legend told of the love of Poseidon for the beautiful youth, and his gift of winged horses of matchless speed, by whose aid and the treachery of Myrtilus he was enabled to win the hand of Hippodamia, daughter of Œnomaus, King of Elis. Each suitor was required to take Hippodamia in his chariot and start from Olympia for Corinth, while Œnomaus offered a sacrifice to Zeus and then pursued. As his horses were a gift of the gods, he had hitherto overtaken and slain thirteen luckless lovers. Pelops bribed Myrtilus, Œnomaus's charioteer, to draw the lynch-pin, and thus secured the victory and the death of Œnomaus. He, however, refused to pay Myrtilus his reward, and even cast him into the sea, wherefore Myrtilus cursed the whole race of Pelops. It may be observed that the Homeric poems know nothing of this curse and the subsequent horrors, which furnished so much material to the Attic dramatists. While the ordinary versions localized this story at Olympia, and associated the Olympic games with Pelops, there are many indications that the race was in some versions considered as crossing the water to or from Lesbos. Of the later fortunes of Pelops many versions were current. He was the father by Hippodamia of Atreus, Thyestes, and other children, and by Axioche of Chrysippus, who was carried off by Laius of Thebes, or murdered by his jealous brothers and stepmother, thus beginning the woes of the family. At Olympia Pelops was especially honored in a sacred inclosure, the

Peloponnesus, where a black wether was yearly offered.

PELO'RIA (Neo-Lat., from Gk. Πέλωρ, *pelōr*, monster). A malformation occurring in flowers which are normally irregular, by which regularity is again attained. It was first described by Linnæus, who found the spurred flowers of the butter-and-eggs or toadflax (*Linaria vulgaris*) with five spurred petals instead of the normal one. The cause of such malformations has not been fully determined, though peloria has been produced by a change in the relation of the plant to light, one-sided illumination appearing favorable to its development.

PELOTA, pȧ-lō'tȧ, or **'JAI-ALAI'** (Sp., from *pilota, pelota*, little ball, from Lat. *pila*, ball). A Basque game introduced into the South American republics, and to Cuba, from the northern provinces of Spain, and imported thence to the United States. It can be played either in or out of doors. Its necessities are a *concha* or court, with level concrete floor 200 feet long and 65 feet wide, with a wall 36 feet square, called the *frontis* or front wall at one end, and at the opposite another similar wall, called *la pared de rebote*, or rebounding wall. On the front wall iron strips painted red mark the boundaries within which the ball must strike. On the floor of the court, occupying the whole space between the two ends, are also boundary lines within which



the ball must, on its rebound, strike, to be counted. A narrow strip 29 feet parallel with the *concha* is the *contra-concha*, within which the ball must remain to avoid being counted as a fault. The instrument with which the game is played is a light wickerwork basket arrangement fastened to the hand by means of a glove attachment. It is called a 'cesta.' The ball is about the size of a lawn-tennis ball. It has a core of india-rubber bound round with yarn, and is covered with sheepskin.

The game is played by four, six, or eight players, mostly by four, two on each side, one of whom on each team is the *delantaro*, or forward, and the other the *zaguero*, or back. Play is on when the forward of the side first entitled to do so runs to a certain mark on the court and throws the ball to the floor, catching it on the bound in the basket attached to his hand, and striking it against the front wall within the red-lined boundaries, whence it should rebound so as to touch the floor between the lines thereon defined. The forward of the opposing side must then strike it with his basketed hand either while it is in the air as it rebounds, or on its first bound from the floor, and throw it against the front wall again; and so on by each team in turn, until one side loses the point. If the ball falls or strikes outside the boundaries, it is a fault to the credit of the opponent. No player may hold the ball in his hand or in the basket; it must always be kept in motion. The first team to gain fifty points wins the game.

PELOTAS, pȧ-lō'tȧs. A town in the State of Rio Grande do Sul, Brazil, 26 miles northwest of the city of that name, on the São Gonçalo, and on the Rio Grande-Cacequy Railway (Map: Brazil (with ARGENTINA), G 10). It is a well-built, handsome city and the centre of an extensive interior and coastwise trade. The principal industry is the curing and preserving of meats, and in addition there are extensive exports of hides, horns, and tallow. The population, in 1894, was about 25,000.

PELOUBET, pĕl'o͞o-bĕt, FRANCIS NATHAN (1831—). An American biblical scholar, born in New York City. He graduated at Williams in 1853 and at Bangor Theological Seminary in 1857, and for twenty-five years held charges in Congregational churches in Massachusetts. In 1884 he revised Smith's *Bible Dictionary*. Peloubet's *Select Notes on the International Sunday-School Lessons* (1875 sqq.) and his *Sunday-School Quarterlies* (1880 sqq., in four grades) became widely known.

PELOUZE, pe-lo͞oz', THÉOPHILE JULES (1807-67). A French chemist. He was assistant to Gay-Lussac and later professor of chemistry at the Ecole Polytechnique and the Collège de France. In 1836 he was associated in research work with Liebig, and in 1837 became a member of the Institute. Pelouze carried out a number of important investigations in chemistry and published several works; jointly with Frémy he wrote a *Traité de chimie générale*, which passed through several editions.

PELS, pĕls, ANDRIES (?-1681). A Dutch poet and critic. He was born in Amsterdam, it seems, and probably studied law there. About 1670 he either founded or revived a literary circle called from its motto *Nil Volentibus Arduum*, with the purpose of purifying the Dutch language and creating poetic canons. This school was vigorously opposed by Joannes Antonides, but it exerted a great and baneful influence on Dutch literature. Pels wrote: *Didoos dood* (1668), a tragedy in the French classical manner; *Horatius Dichtkunst* (1677), a translation and adaptation in verse of the *Ars Poetica; Gebruiken Misgebruik des tooneels* (1681), also didactic; and a posthumous volume of poems, *Minneliedern en Mengelzangen* (1684).

PELTIER, pĕl'tyā'. JEAN CHARLES ATHANASE (1785-1845). A French physicist and me-

teorologist; born at Ham, in the Department of Somme. He was a watchmaker, but gave up his trade at the age of thirty, to apply himself to experimental science. He made several important discoveries in electricity and meteorology, known as the 'phenomena of Peltier,' and published a number of interesting memoirs, including *Sur la météorologie électrique* (1840). He also published an excellent work on water-spouts entitled *Observations sur les causes qui concourent à la formation des trombes* (1840). Consult Peltier, fils, *Notice sur la vie et les travaux de J. C. A. Peltier* (Paris, 1847).

PELU'SIO'TA. A name often applied to Saint Isidorus (q.v.).

PELU'SIUM (Lat., from Gk. Πηλούσιον, mud-city; Egypt. *Am*; probably, though not certainly, identical with the ancient *Avaris*, and the *Sin* of the Old Testament; also called, in Coptic and Arabic, *Pérémoun*, *El-Farmâ*, *Faramâ*). An ancient Egyptian city, situated a few miles from the Mediterranean, at the extreme northeast corner of the Delta, important as the key of Egypt on the Asiatic side. The eastern mouth of the Nile derived from it the name *Pelusiac*. Pelusium was the last stronghold of the Hyksos, and was finally taken by Amasis I. It was the scene of Sennacherib's defeat (II. Kings xviii., xix.). On this occasion, according to Herodotus, the camp of the Assyrians was invaded at night by a host of field-mice, who gnawed their bow-strings and shield-straps, so that in the morning, when the Egyptians fell upon them, they were defenseless. In B.C. 525 the Persians, under Cambyses, defeated the forces of Psammetichus III., near Pelusium, and overthrew the native Egyptian dynasty. The city was taken by Iphicrates and Pharnabazus in B.C. 374, and was besieged and conquered by the Persians in B.C. 369. In B.C. 170 it was the scene of the defeat of Ptolemy Philometor by Antiochus Epiphanes, and in B.C. 55 it was captured by Marcus Antonius. After the battle of Actium in B.C. 31, it fell into the hands of the Romans. It was, according to one account, the birthplace of Ptolemy the astronomer. At present the place is in ruins and nearly level with the surrounding country. Consult: Petrie, *Tanis* (London, 1885-88); Dümichen and Meyer, *Geschichte des alten Aegyptens*; Meyer, *Geschichte des Alterthums* (Stuttgart, 1884-93); E. Amélineau, *Géographie de l'Egypte à l'époque copte* (Paris, 1893).

PELVIC GIRDLE (from Lat. *pelvis*, basin; connected with Gk. πέλυξ, *pelyx*, πέλλις, *pellis*, πέλλα, *pella*, bowl). The pelvic girdle is that part of the vertebrate skeleton which serves for the connection of the hind limbs with the back. Among fishes there is no true girdle, although cartilaginous plates and rods lying in the muscular tissues of the ventral side, and often connected with the pelvic fins, are regarded as rudiments of such a structure. These are best developed in dipnoid fishes, but are quite distinct in the sharks and rays. In the Batrachia we find a well-formed pelvic girdle made up of three parts, a dorsal ilium, an anterior ventral pubis, and a posterior ischium. Each part is made up of a pair of bones, one on each side of the body, and the iliac bones are connected with the sacral vertebræ; the femur articulates with the pelvis at a point known as 'acetabulum,' where the iliac, pubic, and ischiac bones meet. In some salamanders an epipubis is present, consisting of a slender bifurcated rod of cartilage projecting forward from the anterior edge of the pubis. In frogs and toads the iliac bones are very long, while the ischium and pubis are completely fused with the posterior portion of the ilium into a single piece. Among reptiles the same essential elements are present in the pelvic girdle, and the pubic and ischiac bones are united ventrally, more or less perfectly. In crocodiles there is a prolongation of the iliac bone in front of the acetabulum. In birds this prolongation is very marked, but the relative proportion of anterior and posterior parts of the ilium differ greatly in different birds. The pubic bones of birds extend backward parallel with the ischiac, and in many birds fusing with them. All the parts of the pelvis of birds tend to become ankylosed, but a pubic symphysis is present only in the ostrich, and an ischiac symphysis occurs only in the rhea. Among mammals the pelvic girdle shows much variety. Both pubic and ischiac symphyses occur in monotremes, marsupials, many rodents, insectivores, ungulates, and carnivores. The pubic symphysis is wanting in bats and some insectivores, while the ischiac symphysis fails in many insectivores and carnivores and in the primates. In monotremes and marsupials there are present well-developed epipubic bones, known as 'marsupial' bones, though they are not concerned in any way with the marsupium; they are associated with the muscles governing the mammary glands. A fourth element, the 'pars acetabularis,' enters into the formation of the pelvis in the crocodile, birds, and many mammals, and it often shuts the pubis out from a part in forming the acetabulum; occasionally the ischiac bones are also excluded, as in the mole. The pelvic girdle has no fixed position throughout any class, but varies greatly according to the position and function of the hind legs. A pelvis is lacking in the apodous batrachians, in all snakes (with rare exceptions), in a few lizards, and in the Sirenia and Cetacea it is either wanting or reduced to a rudimentary ilium. Consult Wiedersheim's *Comparative Anatomy of Vertebrates* (New York, 1886).

PELVIS (Lat., basin). A bony ring interposed between the spinal column and the lower extremities, so as to transmit the weight of the former to the latter. Before considering the pelvis as a whole, it will be expedient to consider the individual bones of which it is composed. These, in the adult, are four in number, viz. the two ossa innominata which constitute its sides and front, and the sacrum and coccyx, which complete it behind. The *os innominatum* receives its name from its bearing no resemblance to any known body, and is a large irregular shaped bone. In the young subject it consists of three separate bones, which meet and form the deep cup-shaped cavity (the *acetabulum*), situated a little below the middle of the outside of the bone, and in which the head of the thigh-bone rests. Hence it is usual to describe this bone as consisting of the ilium, the ischium, and the pubes. The *ilium* is the superior, broad, and expanded portion which forms the prominence of the hip, and articulates with the sacrum. This bone may be described as divisible into an external and an internal surface, a crest, and an anterior and posterior border. The external surface (see Fig. 1) is convex in front and concave behind; it is bounded above by the crest, below by the upper border of the acetabu-

lum, and in front and behind by the anterior and posterior borders. It presents various curved lines and rough surfaces for the attachment of the *glutei* and other powerful muscles connecting the pelvis and the lower extremities. The internal surface, which is smooth and concave, has the same boundaries as the external, except inferiorly, where it terminates in a prominent line, termed the *linea ilio-pectinea*. The

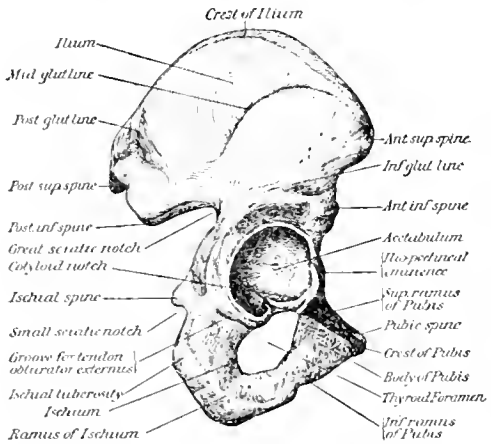


Fig. 1. OS INNOMINATUM OF THE RIGHT SIDE (outer surface).

surface of the crest is convex, roughened, and sufficiently broad to admit of the attachment of three planes of muscles. The borders will be sufficiently understood by a reference to Fig. 1. The *ischium* is the inferior and strongest portion of the bone. It consists of a thick and solid portion, the *body* (whose inferior border is termed the *tuberosity*), and a thin ascending portion, the *ramus*. In the ordinary sitting position the whole weight of the body rests on the ischium; and by sitting on the hands we can usually feel the part (the *tuberosity*, see Fig. 1) through which the weight is transmitted. The *pubis* is that portion which runs horizontally inward from the inner side of the acetabulum for about two inches, and then descends obliquely outward for about the same length, thus making an acute angle with its original direction. The former part is called the *body*, and the latter the *ramus*, of the pubes. The ramus is continuous with the ramus of the ischium. Between the ischium and the pubes is a large aperture, known as the *thyroid* or *obturator foramen*, which in the living body is closed by a membrane termed the *obturator membrane*. The object of this large foramen is probably to give lightness to the parts, without materially diminishing their strength.

The development of the os innominatum affords an excellent example of the general principles laid down in the article OSSIFICATION. There are no less than *eight* centres of ossification for this bone: three primary—one for the ilium, one for the ischium, and one for the pubes—and five secondary ones for various processes, etc. The first centre appears in the lower part of the ilium, at about the same period that the development of the vertebræ commences, viz. at about the close of the second month of fœtal life: the second in the body of the ischium, just below the acetabulum, at about the third month; and the third in the body of the pubes, near the acetabulum, during the fourth or fifth month. At birth the crest of the ilium, the bottom of the acetabulum, and the rami of the ischium and pubes are still cartilaginous. At about the sixth or seventh year these rami become completely ossified; next, the ilium is united to the ischium; and lastly, the pubes is joined to the other two in the acetabulum. The complete ossification of the bone, from the secondary centres in the crest of the ilium, the tuberosity of the ischium, etc., is not completed till about the twenty-fifth year.

Each os innominatum articulates with its fellow of the opposite side through the intervention of the *interosseous fibro-cartilage*, which unites the two surfaces of the pubic bones, with the sacrum, and with the femur (at the acetabulum). No less than thirty-five muscles are attached to this bone, some proceeding to the region of the back, others forming the walls of the abdomen, others forming the floor of the pelvis, others passing downward to the lower extremities, etc. As the other bones entering into the formation of the pelvis (the sacrum and the coccyx) belong essentially to the vertebral column, and will be described in the article on that subject, it is sufficient here to remark that, collectively, they form a triangular bony mass (with the base upward, and with a concave anterior surface), which constitutes the posterior part of the pelvic ring. See Fig. 2.

The pelvis, considered as a whole, is divisible into a false and true pelvis. The *false pelvis* is all that expanded portion which is bounded laterally by the iliac bones, and lies above the prominent line termed the *linea ilco-pectinea* (see Fig. 2); while the *true pelvis* is all that part of the general pelvic cavity which is situated below that line. The broad, shallow cavity of the false

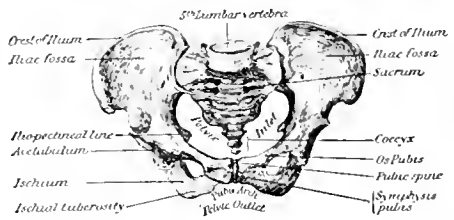


Fig. 2. PELVIS (FEMALE ADULT) SEEN FROM THE FRONT.

pelvis serves to support the weight of the intestines; while the rectum, bladder, and part of the generative organs lie in the cavity of the true pelvis. The upper aperture of the true pelvis is termed the *inlet*. It is somewhat heart-shaped in form, and has three principal diameters—an *antero-posterior* (or sacro-pubic), which extends from the angle formed by the sacrum with the last lumbar vertebra to the symphysis pubis, or point of union of the two pubic bones; the *transverse*, at right angles to the former, and extending across the greatest width of the pelvis; and the *oblique*, extending from the sacro-iliac symphysis (or union), on one side, to the margin of the brim corresponding with the acetabulum on the other. The diameters of the outlet are two—an *antero-posterior*, extending from the tip of the coccyx to the lower part of the symphysis pubis, and a *transverse*, from the posterior part of one ischiatic tuberosity to the same point on the opposite side. As the precise knowledge of the diameter and depth of the pelvis is of the greatest

importance in the practice of midwifery, we give the average numbers representing the dimensions of a well-formed adult female pelvis. *Diameters of inlet or brim*—antero-posterior, 4.4 inches; transverse, 5.4 inches; oblique, 4.8 inches. *Diameters of outlet*—antero-posterior, 5 inches; transverse, 4.3 inches. *Depth of the true pelvis*—posteriorly, 4.5 inches; in the middle, 3.5 inches; anteriorly, 1.5 inches.

The pelvis is placed obliquely with regard to the trunk of the body, the plane of the inlet to the true pelvis forming an angle of from 60° to 65° with the horizon. According to Gray, the extremity of the coccyx is in the female, when standing upright, about one-half inch higher than the lower edge of the symphysis pubis, the upper edge of the symphysis being at the same level as the lower edge of the second segment of the coccyx. By attention to these data, a detached pelvis may readily be placed at the angle at which it normally lies in the skeleton. The shape of the human pelvis is much affected by the curving forward of the lower part of the sacrum. This bend of the sacrum forward serves to support the viscera when the body is in an erect posture; but it is of much more importance in its relation to the act of parturition. If all the antero-posterior diameters of the true pelvis from the brim to the outlet were bisected, the points of bisection would form a curved line, similar to the curve of the sacrum, and termed the *axis* of the pelvis. As the head of the child has to follow this curve, the difficulties of parturition are much greater than if the axis of the pelvis had been straight, as in the other vertebrata. Without entering into unnecessary details, we may remark, generally, that the fœtal head is of oval shape, with its greatest diameter from before backward, and that in its passage through the pelvis it is so placed that its longest diameter at each stage of labor coincides with the longest diameter of the pelvis. The head enters the pelvis with the occiput (or back of the skull) being directed toward one ilium, and the face toward the other, while at its final emergence the face is turned toward the sacrum and coccyx. There can be no doubt that the screw-like or rotatory motion which is thus given to the fœtal head renders its passage through the pelvis more easy than it would otherwise have been.

There are well-marked differences, chiefly having reference to the act of parturition, between the male and female pelvis. In the female the bones are lighter and more delicate than in the male, and the muscular impressions and eminences are less distinctly marked. The iliac fossæ are large and expanded, and hence the great prominence of the hips. The several diameters (particularly the transverse diameter of the brim, which measures only 5.1 inches in the male) are somewhat greater; and the pubic arch is wider by about 10 degrees; the sacrum also is wider and less curved.

It is worthy of notice that the pelvis of the negro is smaller in all its dimensions than that of the European, and presents a partial approximation to that of the monkey, especially in the deficiency of its width. This difference is very much more obvious in the male than in the female negro; and parturition in the black races is facilitated both by the sacrum being less curved, and by the fœtal head being of smaller dimensions. In the apes and monkeys, which approach most nearly to man, the pelvis is longer and narrower, and much less curved than in the human subject. In other mammals the differences are for the most part the same in kind, but greater in degree. In many of the Cheiroptera (bats) and Insectivora (as the mole) the pubic bones are only loosely connected by a small ligament, or there is a complete opening between the bones (as occurs normally in birds), an arrangement by which the act of parturition in these animals is much facilitated. The pelvic bones are very simple in the Cetacea, in some cases being represented by two simple elongated bones lying near the anus, and converging from opposite sides (a transverse connecting piece being sometimes but not always present); in others, by a small V-shaped bone; while sometimes (as in Manatus) they seem to be entirely wanting. The additional pelvic bones in the non-placental mammals have been already noticed in the article on the MARSUPIALIA. In the echidna, which belongs to the Prototheria (*q.v.*), the acetabulum is perforated, as occurs normally in birds. In birds, in addition to the peculiarity just noticed, we find the pelvis open in front (or, more correctly, inferiorly), there being no union of the pubic bones in any bird except the ostrich. This normal incompleteness of the pelvic ring is obviously for the purpose of facilitating the passage of the eggs.

PEM'BA. An island on the east coast of Africa, 30 miles north of Zanzibar (Map: Africa, J 5). It is in the dominions of the Sultan, but under the protectorate of England. It is about 35 miles long, with an area of 380 square miles. It has a luxuriant vegetation, and produces rice, maize, and sugar cane; but since the abolition of slavery on the island agriculture has been neglected. There is some trade in timber and shipping supplies. The population is estimated at 50,000. The chief town is Chake, with a population of 5000.

PEM'BERTON. A town in Lancashire, England, two miles southwest of Wigan (Map: England, D 3). It has manufactures of cottons, chemicals, iron products, etc.; and there are neighboring coal mines and stone quarries. The municipality owns its electric lighting plant. Population, in 1891, 18,400; in 1901, 21,600.

PEMBERTON. JOHN CLIFFORD (1814–81). An American soldier, born in Philadelphia. He graduated at West Point in 1837, and was commissioned second lieutenant of the Fourth Artillery. During the Mexican War he was aide to General Worth, and was brevetted captain for gallantry at Monterey, and major after Molino del Rey. In 1848 he married Miss Martha Thompson, of Norfolk, Va. On the outbreak of the Civil War he refused to serve against the South. On June 15, 1861, he was commissioned major of artillery in the Confederate Army, and June 17th, brigadier general. He served north of the Nansemond River in Virginia until November, 1861, when he was transferred to the Eighth Military District of South Carolina. In January, 1862, he was promoted to be major-general and placed in charge of the Department of South Carolina, Georgia, and East Florida. He was promoted to be lieutenant-general October 13, 1862, and was placed in charge of Mississippi and east Louisiana, succeeding General Van Dorn. He disobeyed the orders of his superior, General

Johnston, to unite with him near Jackson, next to strike General Grant's rear at Clinton, and finally to evacuate Vicksburg. His correspondence with General Johnston was betrayed to General Grant, and he was sharply defeated at Baker's Creek or Champion's Hill, May 16, 1863, and at Big Black Bridge the next day. When he retired into Vicksburg he conducted the defense with skill until July 4th, when he surrendered 31,600 men and 172 cannon. His course met with so much criticism that he resigned his commission after his exchange, but in May, 1864, was placed in charge of the artillery defenses of Richmond, with the rank of lieutenant-colonel, and served here until the end of the war. He then engaged in farming in Virginia until 1876, in which year he removed to Pennsylvania. Consult for Vicksburg, Johnson and Buel (ed.), *Battles and Leaders of the Civil War* (New York, 1887).

PEMBERTON, Max (1863—). An English romancer, born in Birmingham, June 19, 1863. After graduating from Cains College, Cambridge, he joined the staff of *Vanity Fair* (1885). He also began writing stories and miscellaneous articles for several London periodicals, became the editor of *Chums* (1892-93), and in 1896 he became editor of *Cassell's Magazine*. Among his romances are: *The Iron Pirate* (1893); *The Sea Wolves* (1894); *The Impregnable City* (1895); *A Gentleman's Gentleman* (1896); *Queen of the Jesters* (1897); *The Garden of Swords* (1899); *Ffo* (1900); and *House Under the Sea* (1902).

PEMBROKE, pēm'brȳk. A seaport town and the capital of Pembrokeshire, Wales, 42 miles west of Swansea (Map: Wales, B 5). Pator, otherwise called Pembroke Dock, an important fortified Government dockyard, two miles from the town, embraces an area of 80 acres and provides the chief industry of the neighborhood. On the extremity of the ridge on which the town is built are the remains of its extensive castle, founded in 1094, and the birthplace of Henry VII. Beneath the ruins is a remarkable natural cavern, which had communications both with the castle and the harbor. In 1648 the castle was beleaguered by Cromwell and taken after a siege of six weeks. The town dates from the early years of British history. It owns its water supply, slaughter houses, and markets. Population, municipal borough, in 1891, 14,978; in 1901, 15,853.

PEMBROKE. A municipality of Leinster, Ireland, constituting a southeast suburb of Dublin. Population, in 1891, 23,992; in 1901, 25,799.

PEMBROKE, pēm'brōk. A town and the county-seat of Renfrew County, Ontario, Canada, on the Ottawa River, 86 miles from Ottawa (Map: Ontario, F 2). It has saw mills, factories, and a large business in lumber. Population, in 1891, 4401; in 1901, 5156.

PEMBROKE, pēm'brȳk, Earl of. A title of the British family of Herbert (q.v.).

PEMBROKE COLLEGE. A college at Cambridge, England. It was founded by Mary de Saint Paul, wife of Aymer de Valence, in 1347. It has always occupied an honorable place among Cambridge colleges, and has had among its members some of the most distinguished men in England. Of these, the greatest are Pitt, the poets Spenser and Gray, Archbishops Whitgift, Grindal, and Rotherham, the martyrs Ridley, Rogers, and Bradford. The college library, of some 20,000 volumes, is one of the most interesting and valuable college collections in Cambridge. There are thirteen fellowships and twenty-nine scholarships.

PEMBROKE COLLEGE. A college at Oxford, England. It was founded by James I., in 1624, and endowed by Thomas Tesdale, of Glympton, Oxfordshire, and Richard Wightwick, B.D., rector of Ilsey, Berks. It took its name from William, Earl of Pembroke, then chancellor of the university. Its buildings, though not large, and quite modern, are very attractive. The college has a master, ten fellowships, several honorary fellows and lecturers, and twenty-eight scholars, some seventy-five undergraduates in all. Never a large college, a number of distinguished men have been connected with it, especially in the seventeenth and eighteenth centuries. Among these may be mentioned Camden the antiquary, John Pym, Beaumont the dramatist, George Whitefield, Sir William Blackstone, Shenstone, Sir Thomas Browne, and Samuel Johnson.

PEMBROKESHIRE. The westernmost county of Wales, Great Britain, bounded north and west by Saint George's Channel, east by Cardigan and Carmarthen, south by the Bristol Channel (Map: Wales, B 5). Area, 628 square miles. The surface is undulating; the principal elevations are the Preceli Hills, which traverse the north of the county from east to west, and attain a maximum altitude of 1754 feet. The rivers are unimportant; the Eastern and Western Cleddau, which unite and form a navigable portion of Milford Haven, are the principal streams. The northern and western shores are indented with fine bays and dotted with islands; the estuary of Milford Haven forms one of the best harbors on the coast of Great Britain; the south shores are wild and rugged, fronted with precipitous cliffs. The climate is mild but damp. There are excellent and productive soils in the south, and along the northwest coast the barley districts are famous. Oats, barley, and potatoes are the principal crops. Coal, iron, and lead are mined, and slate is quarried. There are important fisheries. The chief towns are Pembroke (the capital), Saint Davids, Tenby, and Haverfordwest. Population, in 1891, 89,000; in 1901, 88,000.

PEMICAN (Cree Indian name). An Indian food preparation much used among all the tribes from about the Canada border to the Eskimo country, and consisting of lean dried meat of buffalo, deer, or, in modern days, beef, pounded to a powder, and liberally mixed with boiling fat, which is poured over it. It is then pressed into cakes and packed into parfleche cases until needed. Berries are frequently pounded up and mixed with the meat. Pemican contains a great amount of nutriment in compact form, and when thus prepared will continue sweet and good for an indefinite time so long as it is kept dry. It is extensively manufactured by the Cree and Red River half-breeds and is the staple commissary article of hunters, traders, and other travelers throughout the great Northwest.

PEMPHI'GUS (Neo-Lat., from Gk. πέμφιξ, *pemphix*, bubble), or PEMPHOLYX. A disease of the skin in which appear on its surface blebs or bullæ filled with serum, pus, or blood, with itching, fever, and great impairment of the general health. Similar blebs appear on the mucous membrane. The blebs burst after a time, leav-

ing a rough, reddened surface, and sealing occurs in the variety termed *pemphigus foliaceus*. This variety is always chronic, and an attack lasts from several months to several years, successive crops of bullæ appearing and rupturing. In *pemphigus vulgaris*, which may be acute or chronic, the vesicles contain clear serum at first. This variety may last but two or three weeks. In the treatment of this disease arsenic, strychnine, iron, and quinine are given internally, local applications of a sedative nature are made, and warm baths are given for months, the patients being suspended under water upon a hammock night and day.

PEN (OF., Fr. *penne*, from Lat. *penna*, pen, feather, OLat. *pesna*, feather; probably connected with Gk. *πτερον*, *pteron*, OHG. *fedara*, Ger. *Feder*, AS. *feþar*, Eng. *feather*, Skt. *patatra*, feather, from *pat*, to fly). An instrument for writing with a fluid ink. For many centuries the quill pen was the only kind used. Isidore of Seville, who died A.D. 636, mentions reeds and pens among the instruments employed in writing. A century and a half later Alcuin writes of the use of pens. Probably their general use began with the introduction of modern paper.

Steel Pens. Toward the close of the eighteenth century various experiments were being made in France, England, and America toward the manufacture of steel pens. At first they were barrel-shaped and were made as much like a quill pen as possible. They were made by bending a flat piece of steel into a tube and then filing it into shape, the joint of the two edges forming the slit. These pens were expensive and unsatisfactory, for they were hard and inflexible. In 1820 Joseph Gillott, of England, began the manufacture of steel pens and greatly improved their form. He also cheapened their price by introducing machinery for their manufacture. Presses were contrived for cutting, bending, and marking, and other machinery for cleaning and polishing. The manufacture of steel pens was not introduced into the United States until about 1860. By that time the art had been perfected and a knowledge of the varieties of steel best qualified for pens had been acquired. Most of the steel used in American factories is imported from Sweden. The steel, which is received by the manufacturer in sheets of varying thickness, is prepared for conversion into pens by a preliminary process of annealing, polishing, and rolling. The last named operation requires considerable care and skill, for the steel must be passed between successive rollers until reduced to a required thickness, which is usually 1-160th of an inch. The slightest variation in the thickness of the sheet affects the flexibility of the finished pen. The blanks are next stamped or pressed into the desired shape, and then the small hole which terminates the slit in the finished pen and prevents it from spreading is punched. After another annealing, the blanks are placed between a pair of dies which give them their curved form. Hardening by plunging into hot oil, cleaning in sand and sawdust, and tempering are the next processes. The polishing is performed by placing the pens in revolving barrels of sand or sawdust and then grinding against a revolving emery wheel. The tempering is done by placing the pens in an iron cylinder which is kept revolving over a charcoal fire until they are of the proper temper. This is a delicate process, regulated by the color shown by the pens, which indicates the temperature of the metal. The last and perhaps most important mechanical operation is slitting the pen point. This is done by a specially constructed pair of cutters of great delicacy of construction. The pens are now subjected to a final burnishing, and possibly lacquering to prevent rust, and are ready for the market.

Gold Pens. Though steel pens are used in greater quantities than any other kind, there is an increasing demand for gold pens on account of their greater flexibility and durability. Gold pens were first made in 1825 in England. In the United States their manufacture was first attempted by a watch-maker of Detroit in 1835. In 1840 the business was moved to New York, various improvements were introduced, and the manufacture grew in importance. At first the points of gold pens were protected by diamonds or rubies. The discovery that the native alloy of iridium and osmium could be used much more cheaply as well as satisfactorily was made by John Isaac Hawkins, an American, residing in England. The American right to this discovery was purchased by a New York establishment. About 1850 it was discovered that by imbedding the iridium points in the gold instead of soldering them on a stronger pen was produced. Gold pens are made in a manner similar to steel pens, by rolling the metal into thin sheets and stamping out the blanks and shaping them with dies. The under side of the point is notched with a circular saw to receive the iridium tip, which is secured by a flux of borax and a blowpipe. The slit is cut through the solid iridium by means of a thin copper wheel, after which it is extended up the pen itself, to the notch, with a saw. The pen is now finished by polishing it and by hammering till the desired degree of elasticity is secured.

Fountain Pens. A fountain pen is one having an ink barrel in the holder which supplies ink as required by means of an automatic feed. Fountain pens were manufactured in England as early as 1835, but they did not attain any great degree of success. In the Schaeffer pen the ink was admitted to the pen from a reservoir in the holder, by pressing a projecting button with the thumb. In the Parker pen the flow of ink was regulated by a piston controlled by a rotating nut. Other early attempts sought to control the flow from the barrel by means of tubes, springs, valves, or other mechanical contrivances. In all these early attempts the flow of ink was found to be irregular. All modern fountain pens are based on a different principle. The flow of ink is regulated by a feed, and air is admitted to the barrel to take the place of the ink as it is used. A typical fountain pen consists of four pieces of hard rubber and a gold pen. The handle containing the ink reservoir is in two pieces, connected with a screw joint, so that it may readily be taken apart for filling. The gold pen is held in the point section of the barrel by means of a third piece of rubber, the feed-bar, which also conveys the ink from the reservoir to the pen. Air is admitted to the barrel, to replace the ink as it is used, by means of a cavity in the feed connecting with the hole at the end of the slit in the back of the pen proper. During the act of writing the ink is drawn from the reservoir by capillary attraction, through the feed to the pen point, and the flow ceases with the writing. The fourth

piece of rubber is the cap, which covers the pen to protect it from injury and keep the ink from drying when not in use. A fountain pen usually holds ink enough for ten hours or more of continuous writing, or from 15,000 words up.

STYLOGRAPHIC PENS, like fountain pens, have a reservoir to hold the ink, but instead of an ordinary pen point it has a pencil-shaped point; the point is tubular and in it plays a needle which releases the ink when pressed on the paper.

STATISTICS. According to the Twelfth United States Census there were in the United States, in 1900, 48 establishments devoted to the manufacture of pens, of which 23 made fountain and stylographic pens, 22 made gold pens, and 3 made steel pens. The combined capital invested in these different establishments is given as $1,444,065, and the value of the annual product $1,855,658. In this amount 8028 gross of fountain pens, valued at $902,734, 1803 gross of stylographic pens, at $82,676, 6735 gross of gold pens, at $158,376, and 1,764,079 gross of steel pens, at $411,872, are included.

BIBLIOGRAPHY. Consult: *The Twelfth Census*, vol. x., part iv. (Washington, 1900), where is published an article entitled "Pens and Pencils;" also Depew, *One Hundred Years of American Commerce* (New York, 1895).

PENAL CODE. A collection or declaration of the laws of a State or country in relation to crimes and their punishment, in a single legislative act. By this means the various acts and omissions which constitute crimes, the degrees of crime, and the penalty imposed for each are all defined and clearly set forth in an orderly manner. Nearly all of the nations of Europe and several of the United States have thus embodied their criminal laws in the convenient and comparatively simple form of a penal code. Some States, including New York, have also adopted a code of criminal procedure which, as its name indicates, provides the mode of enforcing the law as set forth in the penal code. See CODE, and the authorities there referred to.

PENAL LAW. See LAW, CRIMINAL.

PENALTY (Fr. *pénalité*, from ML. *penalitas*, punishment, from Lat. *penalis*, relating to punishment, from *pœna*, punishment, from Gk. *ποινή*, *poinē*, fine, punishment; connected with *τίειν*, *tiein*, Skt. *ci*, to avenge). In the broadest sense, punishment of any kind for violations of law or legal duty, as the 'death penalty.' Usually, however, a 'penalty' is a sum of money the payment of which is required by law as a punishment for an offense, or omission to comply with some statutory provision. In this sense, a penalty is usually imposed for a violation of the law less serious in its nature than a crime, which is *malum in se* (q.v.). For example, a neglect to conform to sanitary regulations generally subjects the offender to payment of a sum of money imposed as a penalty, which is considered as commensurate with the gravity of the offense. Except in aggravated cases, imprisonment would be too severe for omissions of the above nature. A penalty differs but little from a fine in its nature and purposes. As penalties are commonly imposed for the least serious violations of the law, which are, for that reason, not so likely to come to the attention of the proper authorities, the statutes creating them often provide, as an inducement to persons to inform on offenders, that the whole or a part of the penalty shall go to the informer. In some jurisdictions the informer may recover the amount of the penalty by civil action, and in others payment to the public officials is enforced by the alternative of imprisonment, and the amount collected is then paid to the informer.

In the law of contracts the term penalty is applied to an arbitrary sum fixed by the parties to an agreement, to be paid by the one guilty of a breach thereof. This practice is no longer sanctioned, and a sum fixed as a penalty cannot be recovered. Where, however, a sum is based on a calculation as to the probable amount of damages in case of a breach, it will be considered as 'liquidated damages' (q.v.), and payment enforced.

PENANCE (OF. *penance*, *penaunce*, *pencance*, from Lat. *pœnitentia*, repentance, from *pœnitere*, to repent, frequentative of *pœnire*, *puire*, to punish, from *pœna*, punishment). The voluntary or accepted punishment by which a repentant sinner manifests his sorrow for sin, and seeks to atone for the sin, and to avert the punishment which, even after the guilt has been remitted, may still remain due to the offense. Roman Catholics number penance among the seven sacraments (q.v.), and believe it to be of direct divine institution (Matt. xvi. 19; xviii. 18; John xx. 21). The *matter* of this sacrament consists, in their view, of the three acts of the penitent—contrition, or heartfelt sorrow for sin, as being an offense against God; confession, or detailed accusation of one's self to a priest approved for the purpose; and satisfaction, or the acceptance and accomplishment of certain penitential works, in atonement of the sin confessed; and the *form* of the sacrament is the sentence of absolution from sin pronounced by the priest who has received the confession, and has been satisfied of the penitential disposition of the self-accusing sinner. Even in the Apostolic times the practice prevailed of excluding persons of scandalous life from the spiritual fellowship of the Christian community (see EXCOMMUNICATION); and without attempting to fix the date, it may be stated as certain, from the authority of Tertullian and other writers, that from a very early time the persons so excluded were subjected to certain penitential regulations. The class of offenders so treated were those who had been notoriously guilty of the grievous crimes of idolatry or apostasy, murder, adultery, and other scandalous offenses. The period of penitential probation differed in different times and places, but in general was graduated according to the enormity of the sin, some going so far in their rigor (see NOVATIAN) as, contrary to the clearly expressed sense of the Church, to carry it even beyond the grave. The penitent, in ordinary cases, could only be restored to communion by the bishop who had excluded him, and this only at the expiration of the appointed time, unless the bishop himself had shortened it; but in case of dangerous illness he might be restored, with the condition, however, that if he recovered from the illness the whole course of penance should be completed. The reconciliation of penitents took place commonly in Holy Week, and was publicly performed by the bishop in the church, with prayer and imposition of hands. It was followed by the administration of communion. This public discipline continued in force with greater or less

exactness in the fifth, sixth, and seventh centuries, gradually, however, being replaced by semi-public, and ultimately by private penance. In the eleventh and twelfth centuries the public penance had entirely disappeared. The nature and origin of private penance is a subject of controversy between Catholics and Protestants; the former contending that it had existed from the first, and that it held the same place even in the ages of public penance for secret sins which the public penance did for public offenses. At all events, from the date of the cessation of the public discipline it has existed universally in the Roman Catholic Church. The priest, in absolving the penitent, imposes upon him the obligation of reciting certain prayers, undergoing certain works of mortification, or performing certain devotional exercises. These acts of the penitent are held to form an integral part of the sacrament of penance.

Outside of what is explained above as sacramental penance, devout Roman Catholics have always believed in the infliction of voluntary mortifications as being pleasing to God, since they are based on an intense detestation of sin and realization of its enormity; and many of the saints have gone to almost incredible lengths in seeking suffering as a means of purifying the soul and uniting it more closely with God.

Luther fought stoutly against the doctrine of penance current in his day as being contrary to some of what he considered the most essential principles of Scriptural Christianity, particularly to the doctrine of justification by faith in Jesus Christ alone, on the ground of His complete or 'finished' work; penance being founded on a doctrine of at least supplementary atonement by the works or sufferings of man—the sinner—himself. His teaching has been generally followed by Protestants. The outward expressions of humiliation, sorrow, and repentance common under the Jewish dispensation are regarded as very consistent with the character of that dispensation, in which so many symbols were employed. It is also held that the self-inflicted austerities, as fasting, sackcloth and ashes, etc., of Jewish and earliest Christian times, had for their sole purpose the *mortification* of unholy lusts and sinful passions in the people of God; or the expression of sorrow for sin, so that others beholding might be warned of its evil and restrained from it. Accordingly, in the discipline of the Protestant churches penance is now unknown. The nearest approach to the Roman Catholic polity on the subject was that in use among the English Puritans of the seventeenth century, and more particularly in the Church of Scotland during that and the succeeding century, when it was common "to make satisfaction publicly on the stool of repentance." See ABSOLUTION; CONFESSION; INDULGENCE.

PENANG' ('Betel-nut Island'). The most northerly of the British Straits Settlements (q.v.). It consists of the island of Penang, formerly officially called Prince of Wales Island, and the coast districts known as Province Wellesley and the Dindings. The island of Penang, with an area of 107 square miles, is situated off the west coast of the Malay Peninsula at the northern entrance to the Malacca Strait (Map: Burma, D 6). The island is still largely covered with jungle, and is of great commercial importance, Georgetown, the capital, situated at the northeastern extremity, being the chief port of the Straits Settlements next to Singapore. The town is defended by forts, and has a capacious harbor and a large shipping and commerce. In 1898 there entered and cleared at the port 5114 vessels, of 3,761,094 tons. In 1899 the imports amounted to $69,078,371, and the exports to $61,424,108. The principal exports are tin, spices, rice, and sugar, nearly all of which are produced on the mainland. The total population of the Settlement was, in 1891, 235,618, and in 1901, 248,207, mostly Malays and Chinese, there being only 1160 Europeans, most of whom were in the city of Georgetown. The population of Penang Island in 1901 was 128,830, and of Georgetown municipality 94,086. Penang Island was ceded to England in 1785 by the Rajah of Kedah, and organized in the following year under the East India Company, who later purchased Province Wellesley. In 1806 Penang was made a presidency of equal rank with Madras and Bombay, and it remained the chief seat of government of the Straits Settlements, including Malacca and Singapore, until 1832, when the latter city superseded it.

PENARTH'. A seaport of Glamorganshire, Wales, at the mouth of the Taff, opposite Cardiff (Map: Wales, C 5). It is a favorite seaside residence and bathing resort of the Cardiffians. It was an unimportant village until 1856, when its port was made a tidal harbor. It has extensive docks, and is an important shipping port for the minerals of South Wales, especially coal, iron, and alabaster. The docks have 6125 feet of quayage and the tidal harbor 15,000 feet. The town maintains public baths, parks, and pleasure grounds, and an isolation hospital. Population, in 1891, 12,400; in 1901, 14,200.

PENATES, pē-nā'tēz (Lat. nom. pl., gods of the store-room). The Roman gods of the storeroom, worshiped, with Vesta, at every hearth. The proper title is *di penates*, which indicates that a group of gods is here united under a comprehensive title, which is not really a proper name. It thus follows that the individual deities comprised in the title might vary in different families, and this seems proved by the variety of gods who appeared grouped with Lares and Genius as penates in the Pompeian paintings near the hearth. Vesta seems usually, if not always, included in these groups. Each family worshiped its own penates, though under the Empire the penates of the Imperial family were publicly honored. As the family had its private hearth, so the State had its temple of Vesta also, and with her were naturally worshiped the *public* penates, probably a collective title for the gods who cared for the prosperity of the State. Later (before B.C. 167, and probably by some considerable time) a little temple of the penates was built on the Velia, and now images after the type of the Greek Dioscuri were set up. Varro, it is true, denied that these were the true penates, whose sacred symbols were rather kept secretly in the *ædes Vestæ*, but other antiquaries did not follow him, and much ingenuity was displayed in attempted explanation of these mysterious gods. They were identified with the 'great gods' of Samothrace, and after the time of Augustus it was the orthodox belief that they had been brought from Troy to Italy by Æneas. See LARES; MANES.

PENCIL (OF. *pincel*, Fr. *pinceau*, from Lat. *penicillum*, *penicillus*, painter's brush, diminutive of *penis*, Gk. *πέος*, *peos*, tail, penis). An instrument for writing or drawing, employing some coloring material of which it is composed, as lead, graphite, or slate. Probably the pencil was the first instrument used by artists, and in its earliest form consisted simply of a lump of colored earth or chalk, cut into a form convenient to hold in the hand. With such pencils were executed the line-drawings of Aridices, the Corinthian, and Telephanes, the Sicyonian, and also the early one-colored pictures or *monochromata* of the Greeks and Egyptians. The use of metallic lead for marking is of very ancient origin. Pliny refers to the use of lead for making lines on papyrus, and Cortés in 1520 found the Aztecs using lead crayons. Black lead pencils are made of graphite or plumbago, which contains no lead whatever in its composition, but is in reality almost pure carbon. (See GRAPHITE.) The misnomer is probably owing to the fact that, previous to the employment of graphite for making pencils, common lead was used, a material which, indeed, continued to be employed until well into the nineteenth century. Consequently, as the plumbago with its black streak offered a contrast to the pale mark of the lead, it was called, in contradistinction, *black lead*.

DEVELOPMENT OF THE INDUSTRY. The manufacture of graphite pencils in England began in 1564, when a valuable graphite mine was discovered at Barrowdale, Cumberland. The mine was so highly prized that Parliament kept it guarded with an armed force, and, to keep up the value of the product, it was worked only six weeks in the year. The early graphite pencils were made by pulverizing the graphite and compressing it into solid blocks by means of a hydraulic press, and then cutting bars from the blocks. In 1850 the Barrowdale mine became exhausted. Graphite is now mined at Passau, Bavaria; Schwarzbach, Bohemia; in Norway, in New Zealand, in Mexico, and in various parts of the United States. The mine containing the purest graphite yet discovered is located at Ticonderoga, in New York State. It yields a product which is 99.9 per cent. pure carbon. The manufacture of lead pencils is extensively carried on in Germany, England, and America. In Nuremberg, Bavaria, are no less than 23 pencil factories, employing 10,000 workmen and turning out 4,400,000 pencils per week.

PENCIL MANUFACTURE IN THE UNITED STATES. The two raw materials essential for pencil manufacture—pure graphite and excellent cedar for the cases—exist in such generous quantities in the United States as to favor exceptionally the growth of this industry. The first manufacturer of black lead pencils in this country was William Monroe, of Concord, Mass., who in 1812 invented a process by which he pulverized and mixed the material and incased it in cedar holders. He was very successful in selling his product and continued the business for about eighteen months, when he was obliged to give it up on account of the difficulty of obtaining the raw materials. Later he resumed the manufacture of pencils and carried it on, on a small scale, for many years. Another pioneer in the industry was Joseph Dixon, and in 1860 the Fabers established a branch factory in the United States.

METHOD OF MANUFACTURE. The familiar lead pencil of every-day use consists of a round or polygonal stick of graphite mixed with clay, surrounded by a cedar case. The graphite is first reduced to an impalpable powder by grinding. Water is then added and the substance is run through mixers in a fluid state, the proper amount of finely powdered clay being put into the mixture and thoroughly blended with it. A little lampblack is sometimes added to the composition to increase the blackness. The more clay used, the harder will be the pencil. The mixing is performed by specially constructed machinery. After thorough mixing the mass is placed in filter presses to exclude the water and reduce the mixture to a doughy consistency. The material is next passed through dies, consisting of successive plates with holes of varying diameter. Great pressure is used, causing the mixture to ooze forth in doughy strings. This process is repeated several times. The final dies are of the same diameter as the finished lead. The graphite in this form is straightened, cut into three-foot lengths, and allowed to dry. It is next cut into pieces of the required length, usually about seven inches. These pieces are packed in crucibles and burned for several hours, to extract the moisture. The graphite is now ready to be inserted in its wooden case. Sometimes the plumbago is calcined before being mixed with clay. For some varieties of drawing pencils the leads are immersed for a minute in very hot melted wax or suet, before being mounted.

The leads are usually incased in the wood before it is shaped into a pencil. Little slabs of cedar, two, four, or six pencils wide, are passed through a machine which cuts out semicircular grooves, the diameter of the pencil. Into the grooves in one of these slabs the leads are laid and another grooved slab is glued to it, thus completely incasing the graphite. The slabs are now passed through machines which divide them into pencils, with their sides shaped in hexagonal or curved form. After the processes of polishing, varnishing, and stamping, all of which are performed by machinery, the pencils are ready for shipment.

COLORED PENCILS are made of chalk, clay, or wax, mixed with coloring pigments, the nature of which does not permit their being calcined like black pencils. They may be incased in wood like ordinary pencils, or simply wrapped in paper. Toward the close of the last century a process was invented by which both black and colored pencils were incased in paper instead of wood. A sheet of paper cut for a part of its width into strips about one-fourth of an inch wide is wrapped around the lead to form a case of the usual thickness. The surface is painted. When the pencil point wears down to the paper it is sharpened, that is more lead is exposed, by simply unwinding one of the narrow strips of paper.

SLATE PENCILS are sometimes inclosed in wood, but are more often little unprotected rods of slate. Partly from sanitary reasons, they are not nearly so much used as formerly, paper and lead pencil having taken the place of slate and pencil, for most purposes.

STATISTICS. According to the Twelfth Census of the United States, there were in 1900 seven pencil factories, having a total capital of $2,227,-

406, and producing an annual output of 1,385,822 gross of pencils, valued at $1,705,065. The number of factories reported has increased only one since the census of 1860, but the capital invested was then only $6,600, and the value of the product about $20,400. The value of the pencils imported into the United States for the closing decade of the nineteenth century is as follows: 1891, $116,687; 1892, $99,902; 1893, $105,720; 1894, $74,585; 1895, $142,817; 1896, $171,575; 1897, $182,687; 1898, $169,051; 1899, $197,406; 1900, $289,008.

BIBLIOGRAPHY. *The Twelfth United States Census*, vol. x., part iv., "Manufactures," contains historical, descriptive, and statistical matter regarding the pencil industry in this country. The Dixon Crucible Company, of Jersey City, N. J., and L. C. Hardtmuth Company, of New York, both publish pamphlets containing interesting descriptions of methods of pencil manufacture.

PENCIL (in mathematics). See PERSPECTIVE.

PENCK, pĕnk, ALBRECHT (1858—). A German geologist and physical geographer, born and educated at Leipzig. He made special studies of the mountains of Bavaria and Tyrol (1880), and traveled in Scotland and the Pyrenees. After serving as docent at Munich he was in 1885 appointed professor of physical geography at Vienna. He was editor of *Geographische Abhandlungen* (1886 et seq.) and has been one of the contributors to the *Geological Journal* of Chicago. In 1892 he was appointed president of the central commission for the study of the geography of Germany. He wrote: *Die Vergletscherung der deutschen Alpen* (1882); *Die Eiszeit in den Pyrenaen* (1885); *Niederlande und Belgien* (1889); *Donau* (1891); *Morphologie der Erdoberflache* (1894); and *Untersuchungen uber Verdunstung und Abfluss* (1896).

PENCZ, pĕnts, GEORG (*c.*1500-50). A German painter and engraver. He was born at Nuremberg and was probably a pupil of Dürer, or, at least, stood immediately under his influence. He was received into the Painters' Guild in 1523; but in the year following, together with Sebald and Barthel Beham, he was tried for infidelity and banished from the city. In 1525 he was allowed to settle in the neighborhood, and about 1532 he returned to Nuremberg, where he was frequently employed by the city council. In Rome, which he visited before 1530, and again in 1539, he diligently studied Raphael and other great masters, especially the Venetians, and perfected himself in the art of engraving under Marc Antonio. Of the few existing specimens of his historical, allegorical, and mythological paintings, his "Saint Jerome" (1544; in the Germanic Museum, Nuremberg) is the most remarkable. His fame as a painter rests chiefly on his masterly portraits, which for animated conception, excellent modeling, and warm, transparent coloring rank among the finest productions of the Nuremberg school. Especially characteristic are a "Young Man" (1534), "The Painter Erhard Schwetzer" (1544), and his "Wife" (1545), all in the Berlin Museum; a "Young Man" (1543), in the Vienna Museum; and "Fieldmarshal Sebaldus Schirmer" (1545), in the Germanic Museum, Nuremberg. All others in the various galleries of Europe are surpassed by the exquisite portrait of a "Scholar" in the Karlsruhe Gallery. Penez is most prominent as an engraver, ranking next to the Behams among the "Little Masters." In some of his plates he equals his master, Marc Antonio. Besides his largest plate "The Taking of Carthage" (1539, after Giulio Romano), may be mentioned the "Six Triumphs of Petrarch," "Life of Christ" (26 pieces), "Medea," "Paris," "Vergil and the Countess," and the portrait of John Frederick, Elector of Saxony. Consult: Scott, *The Little Masters* (London, 1880); and Kautzsch, *Der Maler Georg Pencz* (Leipzig, 1895).

PENDA. A king of the Anglo-Saxon Kingdom of Mercia (q.v.).

PENDANT (Lat. *pendens*, hanging, pres. part. of *pendere*, to hang). A hanging ornament, used in ceilings, vaults, staircases, timber roofs, as the end of keystones, posts, corbels, etc. It is sometimes a simple ball, and sometimes elaborately ornamented, and is chiefly used in the later Gothic and Renaissance styles.

PEND D'OREILLE, pän dŏrā'y'. See KALISPEL.

PENDEN'NIS, THE HISTORY OF. A novel by W. M. Thackeray (1850). Arthur Pendennis, the hero, a weak, commonplace, but thoroughly life-like young man, spoiled by an indulgent mother, and his own worst enemy, nearly wrecks himself in imprudent love affairs. From one such affair with an actress he is saved by his uncle, Major Pendennis, a shrewd man of the world. When he is jilted by Blanche Amory, he realizes the devotion of his cousin Laura and marries her. After a struggle, he becomes a successful writer in London, and as such tells the story of *The Newcomes*.

PENDENTIVE. A section of masonry forming the transition between a domical vault and the walls or piers supporting it. It occupies the angle where two walls meet and is usually roughly triangular in shape, with the apex below. The development of the pendentive by Byzantine architects of the sixth century made it possible to erect domes (q.v.) above rectangular or polygonal interiors, and this made it one of the greatest acquisitions in the history of architecture. Such pendentives are, strictly speaking, formed of a curved surface, but any device for passing from a vault to a wall of different plan may, by extension, be called a pendentive, as in the case of corner slabs or lintels, receding corbels, cones, and especially the Mohammedan stalactite pendentive.

PEN'DER, WILLIAM DORSEY (1834-63). An American soldier, born in Edgecombe County, N. C. He was graduated from West Point in 1854 and assigned to the artillery. He served against the Seminole Indians in New Mexico, and in the Apache campaign in 1856. He resigned in 1861 and was made captain of artillery in the Confederate Army, and May 16th was promoted to be colonel of the Third North Carolina Infantry. He was engaged at Bull Run, and at Seven Pines was made temporary brigadier-general. The appointment was made permanent after Gaines's Mill and Frazier's Farm. At the second battle of Bull Run he fought on foot, leading his men [illegible] again against the impregnable [illegible]. He was engaged at Winchester, [illegible] and Fredericksburg, winning the [illegible] 'Stonewall' Jackson. Pender [illegible]

general May 27, 1863, and took part in the invasion of Pennsylvania. On the first day at Gettysburg he attacked Seminary Ridge and was killed on the second day.

PENDLETON, pĕn'd'l-tŏn. A town of Lancashire, England, suburban to Manchester on the northwest (Map: England, D 3). Pendleton is part of the Parliamentary borough of Salford, and is incorporated with its municipality. The rapid increase of its population is due to the immense industries of the locality, which are identified with those of Salford and Manchester (q.v.). Population, in 1891, 57,000; in 1901, 75,000.

PENDLETON. A town and the county-seat of Umatilla County, Oregon, 47 miles southwest of Walla Walla, Wash.; on the Umatilla River, and on the line of the Oregon Railroad and Navigation Company and the Washington and Columbia River Railroad (Map: Oregon, G 4). It is the centre of a productive region interested largely in grain cultivation and in the raising of cattle, sheep, and horses; and has flouring mills, woolen and wool-scouring mills, machine shops, etc. Some of these establishments are operated by water power supplied by the river. The chief building is a fine court-house; and there are three bridges across the Umatilla here. The water-works are owned by the municipality. Population, in 1890, 2506; in 1900, 4406.

PENDLETON, Edmund (1721-1803). An American statesman of the Revolutionary period. He was born in Caroline County, Va., and was wholly self-educated. In 1744 he was admitted to the bar, and in 1752 was elected to the House of Burgesses, of which he was was a member for many years, serving several terms as Speaker. He was a member of the Committee of Correspondence in 1773; was a delegate to the First Continental Congress (1774); and was president of the Virginia conventions of 1775 and 1776. The resolution of May, 1776, instructing the State delegates to introduce a declaration of independence in Congress, was written by him. In 1776 he became president of the Committee of Safety, and, on the organization of the State Government, was elected Speaker of the House of Burgesses, and, somewhat later, president of the Court of Chancery. In 1777 he was crippled for life, but continued to serve as Speaker of the House, and in 1779 became president of the Court of Appeals, which position he held until his death. In 1788 he presided over the Virginia convention which ratified the Federal Constitution, he himself taking an active part in the debate and being largely responsible for the final decision.

PENDLETON, George Hunt (1825-89). An American lawyer, legislator, and civil-service reformer, born in Cincinnati, Ohio. He studied law, was admitted to the bar in Ohio, and became distinguished in his profession. He was a member of the State Senate in 1854-55; was elected to Congress in 1856; and served successively in the Thirty-fifth, Thirty-sixth, Thirty-seventh, and Thirty-eighth Congresses, being a member of the House Committee on Military Affairs during the first three terms, and a member of the Ways and Means Committee during the last term. He identified himself with the Anti-War Democrats, and attracted much public criticism on account of the boldness of his antagonism to the course of the Administration. In 1864 he was nominated for the Vice-Presidency of the United States on the ticket with General McClellan. Pendleton was one of the most prominent leaders of the Greenback Party, strongly opposing the payment of the Government bonds in gold, and the contraction of the currency. In 1879 he was elected to the United States Senate, where he won distinction as chairman of the Committee on Civil-Service Reform. Late in 1882 he introduced in the Senate the so-called Pendleton Bill for reforming the civil service. This bill passed the Senate on December 27th, and the House on January 5, 1883, and was approved by President Arthur on January 16th. It marks the first definite establishment of the merit system as opposed to the spoils system in the United States. (See Civil-Service Reform.) At the expiration of his term as United States Senator in 1885, he was appointed by President Cleveland Minister to Germany, which post he held until the time of his death, at Brussels, in 1889.

PENDLETON, William Nelson (1809-83). An American clergyman and Confederate soldier, born in Richmond, Va. He graduated at West Point in 1830; was assistant professor of mathematics there (1831-32); and resigned from the army in 1833. He taught in Bristol College, Pa., and Delaware College, and in 1839 became rector of the Episcopal Diocesan School at Alexandria, Va. At the outbreak of the Civil War he entered the Confederate service and became chief of artillery in the Army of Northern Virginia. In 1862 he was promoted to be brigadier-general, and in 1865 served as one of Lee's commissioners on surrender. At the close of the war Pendleton became rector of Grace Memorial Church, Lexington, Va. He wrote *Science a Witness for the Bible* (1860).

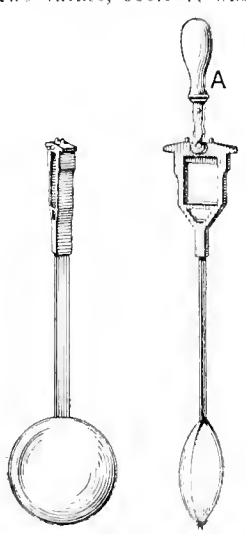
PENDULUM (Neo-Lat. neu. sg. of Lat. *pendulus*, hanging down, from *pendere*, to hang). A pendulum is any rigid body pointed about a horizontal axis so that it can swing to and fro, making vibrations under the influence of gravity. A 'simple' pendulum is the name given an imaginary pendulum consisting of a particle of matter suspended from a point by a cord supposed to be without mass. If the length of this cord is l and if g is the acceleration which the suspended particle would have if allowed to fall freely toward the earth, the period, or time taken for one complete vibration of the simple pendulum swinging in a vertical plane through very small arcs, is $2\pi\sqrt{\frac{l}{g}}$. The period of any actual or 'compound' pendulum is given by the formula $2\pi\sqrt{\frac{I}{mgl}}$, where I is the moment of inertia of the pendulum about its axis of suspension, m is its mass, l is the distance from the centre of gravity to the axis, and g has it usual value. It is seen that the period of vibration of a pendulum is constant, being independent of the extent of the amplitude of vibration, provided only that it be small compared with l. This fact was made use of by Galileo, who also recognized the connection between the period and the length of a pendulum.

The length of the pendulum, as will be seen from the formula, varies as the square of the

time of oscillation, and consequently a pendulum with a vibration period of one-half second has but one-quarter the length of a seconds pendulum. It is also apparent that pendulums of different kinds of matter—but in other respects identical—should have the same periods of vibration if g is the same for the different kinds of matter. This idea was tested by Newton and later by Bessel, who found that within experimental limits g is the same for all forms and kinds of matter. If g is different at different places on the earth, the fact will be shown by measuring the period of the same pendulum at these places. This was shown to be the case by Huygens.

The problem of deducting the length of a simple pendulum which should have the same period as a given compound pendulum was first solved by Huygens. See CENTRE OF OSCILLATION and MECHANICS.

If the same pendulum is swung at various positions on the earth's surface, its time of vibration will vary depending on the value of g. Accordingly one of the best methods of determining this quantity is to cause a pendulum to swing at different stations and carefully and exactly measure its time of oscillation. In the United States this work is done by the United States Coast and Geodetic Survey, and from their observations the value of the absolute force of gravity in the pendulum room of the Coast and Geodetic Survey at Washington has been found to be 980.165 on the C. G. S. system. The relative measure between Paris and Washington gave $g = 980.169$, and, accordingly, the mean of these two values, 980.167, was adopted.



HALF-SECOND PENDULUM.
Front and side views of United States Coast and Geodetic Survey standard form. A, handle for lifting pendulum from the knife edges on which it is suspended.

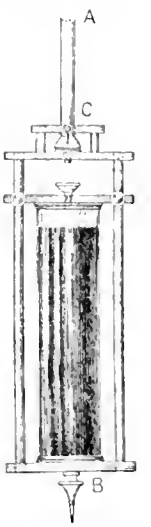
The pendulums used in the United States Coast and Geodetic Survey for gravity determinations swing with a period of one-half second in a case from which the air has been exhausted. The stem is flat and carries a lenticular bob, the pendulum being supported on agate bearings. A beam of light is thrown into the pendulum receiver every second, and when the pendulum is vertical it is reflected into a telescope through the coincidence of two slits. A carefully rated chronometer forms a part of the apparatus and enables the observer to determine with great accuracy the time of vibration of the pendulum. The instruments of the Survey are extremely portable, and the observers travel from station to station making observations.

This variation in time of oscillation is shown below in figures from three stations in North America, with considerable difference in their latitude. A pendulum whose period of vibration in Washington was .5008383 second had a period at Key West, Fla., of .5011320 second and at Umanak, Greenland, of .5002032 second.

Another application of the pendulum due to Foucault is to show the rotation of the earth. Using a long pendulum with a heavy weight, he found that the plane of oscillation would shift in the same direction as the motion of the sun, or opposite to the rotation of the earth. Were the pendulum to vibrate at the pole, it would continue in the same plane while the earth rotated, the path of the pendulum appearing to make one complete revolution in twenty four hours. At the equator, on the other hand, there would be no rotation of the plane of vibration.

In order to determine the length of a seconds pendulum at any particular place, the method devised by Captain Kater of using a reversible pendulum is employed. Here the centre of oscillation and the centre of suspension are interchangeable, and the apparatus will be equivalent to a simple pendulum, whose length is the distance between them. In practice these two points are formed by knife edges, which can be moved with respect to each other along a rod so that the vibrations of the pendulum will be synchronous irrespective of the knife edge by which it is supported.

COMPENSATION PENDULUM. As the length of a rod or bar of any material depends on its temperature (see HEAT), a clock with an ordinary pendulum goes faster in cold and slower in hot weather. In the method of correction usually employed, and called *compensation*, advantage is taken of the fact that different substances have different coefficients of linear expansion; so that if the bob of the pendulum is so suspended as to be raised by the expansion of one substance, and depressed by the expansion of another, the lengths of the effective portions of these substances may be so adjusted that the raising and depression, taking place simultaneously, may leave the position of the bob unaffected. There are two common methods of effecting this, differing a little in construction, but ultimately depending on the same principle. Of these, the *mercurial* pendulum is the more easily described. The rod AC and the framework CB are of steel. Inside the framework is placed a cylindrical glass jar, nearly full of mercury, which can be raised or depressed by turning a screw. With an increase of temperature, the steel portion AC is lengthened by an amount proportioned to its length, its coefficient of linear dilatation, and the change of temperature, conjointly and thus the jar of mercury is removed from the axis of suspension. But neglecting the expansion of the glass, which is very small, the mercury rises in the jar by an amount proportional to its bulk, its coefficient of cubical expansion, and the change of temperature conjointly. Now, by increasing or diminishing the



MERCURIAL COMPENSATING PENDULUM.

quantity of mercury, it is obvious that we may so adjust the instrument that the length of the equivalent simple pendulum shall be unaltered by the change of temperature, whatever be its amount, so long as it is not great enough to change sensibly the coefficients of dilatation of the two metals.

The construction of the *gridiron* pendulum will be easily understood from the cut. The shaded bars are steel; the second and fourth ones are zinc, or some substance whose coefficient of linear expansion is considerably greater than that of steel. It is obvious from the figure that the horizontal bars are merely connectors, and that their expansion has nothing to do with the vibration of the pendulum, so they may be made of any substance. It is easily seen that an increase of temperature lowers the bob by expanding the steel rods, whose effective length consists of the sum of the lengths of one of the outer rods and the steel bar to which the bob is attached; while it raises the bob by expanding the zinc bars, whose effective length is that of one of them only, the other, as well as one of the outside steel rods, being added to the instrument for the sake of symmetry, strength, and stiffness only. If the effective lengths of steel and brass be inversely as their respective expansion coefficients, the position of the bob is unaltered by temperature; and therefore the pendulum will always vibrate in the same period. This is on the supposition that the weight of the framework may be neglected in comparison with that of the bob; if this weight must be taken into account, the requisite adjustments, though possible, are greatly more complex, and can only be alluded to here. Practically, it is found that a strip of dry fir-wood, carefully varnished to prevent the absorption of moisture, and consequent hygrometric alterations of its length, is very little affected by change of temperature; and in many excellent clocks this is used as a very effective substitute for the more elaborate forms just described. In astronomical clocks, though they are kept at a temperature as nearly constant as possible, the compensation of the pendulum is a matter of delicacy.

GRIDIRON COMPENSATING PENDULUM.

PENEL'OPE (Lat., from Gk. Ηηνελόπη, *Pēnelopē* Ηηνελόπεια, *Pēnelopeia*). In Greek legend, a daughter of Icarios of Sparta and Peribœa, and wife of Odysseus. According to the Homeric story, Odysseus was soon called to the Trojan War, leaving his wife with their infant son Telemachus at Ithaca. When Troy had fallen and years passed without his return, numerous suitors gathered at his palace, whom the youthful Telemachus could not dispossess, though they devoured and wasted his father's goods, while importuning Penelope to choose a husband. For some time she put them off under the plea that she must first finish the shroud she was weaving for old Laertes, father of Odysseus. To protract the time, she unraveled at night what she wove by day. Betrayed by a maid, she was compelled to finish the work, and the suitors were preparing to force a decision, when Odysseus returned, and slew them. Later epics told how Odysseus was subsequently slain in ignorance by Telegonus, his son by Circe, and how after his death Telemachus, Telegonus, and Penelope journeyed to Circe's island, where Telemachus wedded Circe, and Telegonus Penelope. There is considerable evidence connecting both Odysseus and Penelope with Arcadia, as local divinities. At Mantinea the grave of Penelope was shown, and in Arcadian legends she is a nymph, who became by Hermes (or in another version by all the suitors) the mother of Pan. The later writers endeavored to account for her grave by saying that when Odysseus learned of her infidelity, he dismissed her, whereupon she wandered to Lacedæmon, and then to Mantinea, where she died.

PENEPLAIN. See PLAIN.

PENETRATION OF A PROJECTILE. See BALLISTICS.

PEN'FIELD, EDWARD (1866—). An American artist, born in New York City. He studied at the Art Students' League in New York City, and afterwards in Holland and England. He was associated with the Harpers Publishing Company from 1891 until 1901, and designed several posters, magazine covers, and calendars for them. He was one of the first in America to make poster designs in color, and showed himself to be an artist of originality and unusual force, especially in drawings of small size. His other works include decorations in Randolph Hall, Cambridge, Mass.

PENFIELD, SAMUEL LEWIS (1856—). An American mineralogist, born at Catskill, N. Y. He graduated in 1877 at the Sheffield Scientific School of Yale, and was appointed professor of mineralogy there. Penfield was elected to the National Academy of Sciences. His publications include: *Determinative Mineralogy and Blow-Pipe Analysis* (1898), and contributions to the *American Journal of Science and Art* on crystallography and mineralogy.

PENFIELD, SMITH NEWELL (1837—). An American organist and composer. He was born in Oberlin, Ohio, and graduated from Oberlin College. After teaching music for several years in Rochester, N. Y., he studied in Leipzig under Moscheles, Reinecke, and Plaidy, and on his return to America lived for some time in Savannah, Ga., then in Brooklyn, N. Y., where he was for two years organist of the Church of the Pilgrims, and in New York, where he held like positions in Saint George's, Saint Mark's, the Broadway Tabernacle, and the Scotch Presbyterian Church. In Savannah he founded the Mozart Club and a Conservatory of Music, and in Brooklyn the Arion Conservatory. Among Penfield's many compositions are services of the Episcopal canticles, a cantata entitled *The Eighteenth Psalm*, as well as marches, choruses, glees, and solos.

PENGE. A municipality of Surrey, England, and a residential suburb of London, seven miles southeast of Saint Paul's. Population, 1891, 20,400; 1901, 22,460.

PENGUIN (possibly from Welsh *pen gwen*, white head, applied to the auk and later transferred to the penguin, or perhaps from a native

South American name). One of the Antarctic seabirds of the family Spheniscidæ, representing the larger group Sphenisci. They have short wings, quite unfit for flight, but covered with short rigid scale-like feathers, and much like the flippers of turtles. The legs are very short, and are placed very far back, so that on land penguins rest on the tarsus, which is widened like the sole of the foot of a quadruped, and they thus maintain a perfectly erect posture. Their bones, unlike those of birds in general, are hard, compact, and heavy, and have no air-cavities; those of the extremities contain an oily marrow. The body is of an elliptical form; the neck of moderate length; the head small; the bill moderately long, straight, more or less compressed; the tail very short. They are among the most aquatic birds, and spend little more time on shore than is necessary for sleeping and reproduction. Their food consists of all the small life of the sea, which they catch by swimming and diving often to very great depths. The wings are modified internally as well as externally to make them effective aids in this work, and are used not together like oars, as other birds swim under water, but alternately and with a twisting motion, so that no part of the result of the effort is neutralized and continuous and very rapid progress is made without the aid of the feet, which merely serve as rudders. Underneath their skin is a layer of blubber-like fat, which assists them to withstand the icy air and water of their habitat. They go about in swimming 'schools,' and gather at their breeding grounds in enormous flocks.

About fifteen species are known, mainly in high southern latitudes, although some species straggle as far north as Peru and Brazil, New Zealand, and the Cape of Good Hope. It is upon the islands about Cape Horn and in the Antarctic Sea that they abound and breed in the greatest numbers. Some gather stones, bits of stick, grass, etc., into a sort of a nest; others make no nest whatever; while the king penguin, and perhaps some others, incubate the egg as do their Arctic analogues, the auks, by holding it between their thighs, resting upon the top of their feet, the male and female relieving each other at intervals. A single egg only is laid, but it is tended and guarded with great care; and the mother penguin is said to keep her young one with her for a twelvemonth.

The king penguins (Aptenodytes) are among the largest. They stand three feet high, and are grayish blue with black heads, white breasts, and orange or yellow throats. They exist in colonies of many thousands. The 'jackass-penguins' (Spheniscus) are medium-sized or small species with a stout bill. They receive their popular name from their cry. The rock-hoppers or macaronis (Eudyptes) are notable for being curiously crested with curly yellow plumes on each side of the head. The smallest known species of penguin is *Eudyptila minor* of Australia and New Zealand, which is only about a foot long. In the Eocene rocks of New Zealand fossil remains of a giant penguin (*Palæeudyptes antarcticus*) have been found, indicating a bird six or seven feet high.

Consult: Newton, *Dictionary of Birds* (New York, 1893); Stejneger, *Standard Natural History*, vol. iv. (Boston, 1885); Buller, *Birds of New Zealand* (2d ed., London, 1888); Darwin, *A Naturalist's Voyage* (New York, 1899); Mosely, *The Naturalist in the Challenger* (London, 1879); and the writings of Antarctic navigators. See Plate of Auks, Albatross, etc.

PENHALLOW, pēn-hŏl'lō, Samuel (1665-1726). An American colonist and historian, born at Saint Mabon, Cornwall, England. He came to Massachusetts with the Rev. Charles Morton, his teacher, in 1686; lived for a time at Charlestown, Mass., and then removed to Portsmouth, N. H., where by marriage and business successes he acquired a considerable fortune, and was successively made a magistrate, a member of the council, recorder of deeds, and justice of the Supreme Court of Judicature (1714), of which court he was Chief Justice from 1717 until his death. He was also for several years treasurer of the colony. He is remembered as the author of a *History of the Wars of New England with the Eastern Indians, or a Narrative of Their Perfidy and Cruelty* (1726; reprinted in the *Collections* of the New Haven Historical Society in 1824, and separately at Cincinnati in 1859), which covers the period from 1703 to 1726, is the chief contemporary authority in English on Queen Anne's War, and the so-called Lovewell's War, and has been of great value to historians.

PENINSULAR CAMPAIGN. The name given to the campaign of General McClellan, at the head of the Federal Army of the Potomac, against Richmond, Va., in April-July, 1862, during the Civil War. The campaign was so named because of McClellan's attempt to reach the Confederate capital by way of the peninsula formed by the York and the James rivers. For details see McClellan, G. B.; Civil War in America; Yorktown; Williamsburg; Seven Pines; Gaines's Mill; Seven Days' Battles; Malvern Hill.

PENINSULAR STATE. Florida. See States, Popular Names of.

PENINSULAR WAR, The. The struggle carried on in the Iberian Peninsula from 1807 to 1814 between the Emperor Napoleon on the one side and the Spaniards, the Portuguese, and the English on the other. After the Treaty of Tilsit Napoleon resolved to seize Portugal in order more perfectly to enforce his Continental System (q.v.) against England. With the connivance of Spain, a French army under Junot invaded Portugal and occupied Lisbon on November 30, 1807. The flight of the royal family to Brazil left the Portuguese for the moment leaderless, but the English soon came to their assistance and, under the command of Sir Arthur Wellesley, afterwards Duke of Wellington, defeated Junot at Vimeiro on August 21, 1808, and by the Convention of Cintra, nine days later, forced him to evacuate Portugal. In the mean while the family affairs of Spanish royalty gave Napoleon a pretext for interfering in Spain. Armies under the direction of Murat occupied the country and on June 6, 1808, Joseph Bonaparte was proclaimed King of Spain. (See Charles IV.; Ferdinand VII.) One of the divisions of the French army of occupation was trapped by the Spaniards and forced to surrender at Bailen (q.v.) on July 20, 1808. This disaster so startled Napoleon that immediately after the Congress of Erfurt he in person undertook a campaign in Spain with three large armies and occupied Madrid on December 4, 1808. His army was lured away from Madrid by an English army under Sir John Moore, who

invaded Spain from Portugal and then conducted a skilful retreat to Coruña. During the pursuit Napoleon turned over the command to Soult and hurried away to prepare for the campaign against Austria. While Napoleon's marshals were busy completing the conquest of the Peninsula, an English army under Wellesley landed at Lisbon on April 22, 1809. Having taken Oporto from Soult, Wellesley invaded Spain and fought a drawn battle with King Joseph and Marshal Victor at Talavera de la Reina on July 27th-28th. This battle saved Portugal from further harrying by the French, who, however, won a series of successes in Spain, including the victories of Almonacid on August 11th and Ocana on November 18th. By the beginning of the summer of 1810, the French had subjugated practically the whole of Spain. The Province of Galicia and the fortified towns of Cadiz, Valencia, Badajoz, and Ciudad Rodrigo were the only important places still held by the Spaniards. During 1810 Napoleon hoped to take these places and to drive the English out of Portugal. With this purpose, a large army under Masséna laid siege to Ciudad Rodrigo, which was captured on July 19th. Invading Portugal, Masséna captured Almeida on August 26th, and after a repulse by Wellington at Busaco on September 27th, continued the pursuit of that general, who retired behind the well-fortified lines of Torres Vedras. The devastation of the country by the Portuguese, the incessant guerrilla warfare waged by the Spaniards, and the jealousies of the French marshals spoiled the plan of campaign. Soult captured Badajoz on March 11, 1811, but failed to coöperate with Masséna, who was forced to abandon the attempt to carry the lines of Torres Vedras in order to prevent the recapture of Almeida. Wellington defeated Masséna at Fuentes de Onoro on May 5th and the English reoccupied Almeida. During the year the French, under Soult, were defeated at Albuera on May 16th, and under Gérard at Arroyo Molinos on October 26th, and their only success was in Aragon and Valencia under Suchet, who captured the city of Valencia on January 10, 1812. In the same month Wellington took the offensive, captured Ciudad Rodrigo on January 19th, and Badajoz on April 6th, and defeated Marmont at Salamanca on July 22d, but failed to capture Burgos and retired into winter quarters in Portugal. Elsewhere in Spain the French held their own until the withdrawal of troops from the Peninsula for the campaign of 1813 in Germany. The resumption of hostilities by Wellington forced King Joseph to abandon his capital and retreat toward the northern mountains. Wellington pushed the campaign with vigor, defeating Joseph and Jourdan at Vitoria on June 21, 1813, capturing San Sebastián on August 31st, and invading France. Soult failed in successive attempts to check Wellington's victorious advance in Southern France in the battles on the Nivelle, on the Nive, at Orthez on February 27, 1814, and at Toulouse on April 10th. Suchet succeeded in withdrawing his army from Aragon without loss and was marching to the assistance of Soult when the news of Napoleon's abdication arrived. The termination of the war at this moment enabled the English to transport many of Wellington's veterans to America to take part in the campaign of 1814 against the United States. Politically the invasion of the Peninsula was the most costly error in Napoleon's career, for there he first aroused that spirit of nationality which was destined to bring disaster on him not only in Spain, but in Germany as well. From a military point of view the war in the Peninsula was a stupendous blunder for Napoleon, for it made a wanton increase in the number of his foes, it gave England her longed for opportunity of fighting him on land, while its campaigns and its guerrilla warfare cost Napoleon thousands of men and proved demoralizing to the efficiency of his army, so that in his final campaigns he found himself with a formidable foe at his rear and was therefore unable to put in the field against his great Continental enemies, Austria, Prussia, and Russia, the full military power of the French nation.

Bibliography. The best brief sketch is Shand, *The War in the Peninsula* (New York, 1898). The standard works are: Napier, *History of the War in the Peninsula* (London, 1828-40); and Foy, *Histoire de la guerre de la Péninsule sous Napoléon* (Paris, 1827). The best works of recent scholarship are Gomez de Arteche y Moro, *Guerra della independencia* (14 vols., Madrid, 1868-1903); Latino Coelho, *Historia politica e militar desde os fins do 18 seculo ate 1814* (Lisbon, 1886); and Oman, *History of the Peninsular War* (New York, 1902).

PENITENTIAL PSALMS. A name given to seven of the psalms, as being specially expressive of sorrow for sin, and accepted by Christian devotion as forms of prayer suitable for the repentant sinner. They are Psalms vi., xxxii., xxxviii., li., cii., cxxx., and cxliii., according to the Authorized Version, which correspond with vi., xxxi., xxxvii., l., ci., cxxix., and cxlii. of the Vulgate. These psalms were set apart at a very early period, and the collection is referred to by Origen. Pope Innocent III. ordered that they should be recited in Lent.

PENITENTIARY. A term commonly used as synonymous with prison (q.v.).

PENITENTIARY. In the history of the Roman Catholic Church, a priest attached to cathedral churches, whose special duty it is to deal with difficult cases of the judgment to be passed on grave sins and the penance to be prescribed for them. The custom of appointing such officials is at least as old as the outbreak of the Novatianist schism; but the fourth Lateran Council, of 1215, prescribed their appointment for all metropolitan and cathedral churches, to represent the bishop in such matters when he was absent or otherwise hindered from giving his personal attention to the matter. Since the Council of Trent the office has normally been held by a member of the cathedral chapter, sometimes combined with that of vicar-general. The cardinal penitentiary is an officer of the Roman curia who holds a corresponding position in regard to cases of absolution or dispensation such as are reserved to Papal decision. He must be a priest, and hold the degree of master in theology or doctor in canon law. He is assisted by an official theologian and canonist, and has a number of subordinates, who together make up the branch of the Roman administration called the *Penitenziaria*. A monthly session is held for the discussion of the more important cases, which are then, if necessary, referred directly to the Pope.

PENJAMO, pān'hä-mō. A town of Guanajuato, Mexico, 50 miles southwest of the city of

that name, on the Guadalajara branch of the Mexican Central Railroad (Map: Mexico, H 7). Its population, in 1895, was 7558. The patriot Hidalgo was born on the neighboring hacienda of Corralejo, and here, in 1817, the filibuster Mina was shot.

PENJDEH, pĕnj'dĕ. An oasis in the southern part of Russian Turkestan, 25 miles from the boundary of Afghanistan (Map: Asia, Central, H 3). It belonged to the latter country until 1885; in that year it was the scene of the defeat of a body of Afghan troops by the Russians, which brought about strained relations between England and Russia.

PENN, John (1729-95). A proprietary Lieutenant-Governor of Pennsylvania. He was born in London, and was a grandson of William Penn. After a course in the University of Geneva, he went to Pennsylvania, where, in 1753, he became a member of the council. He was a member of the Albany Congress of 1754, and in 1763 became Lieutenant-Governor of Pennsylvania, which office he held until 1771, and then, after a visit to England, from 1773 to 1775. When the Revolutionary War broke out, although he attempted to maintain a neutral attitude, his authority was soon superseded by that of a revolutionary government, and in 1777 he was imprisoned, but after a few months was released. He received one-fourth of the £130,000 voted by the Legislature in compensation for the confiscated proprietary rights, and the same share of a £4000 annuity later granted the proprietors by the English Government. Consult: the *Pennsylvania Archives;* and Sheperd, *Proprietary Government in Pennsylvania*, vol. vi. of the "Columbia University Studies in History, Economics, and Public Law."

PENN, John (1741-88). An American patriot, one of the signers of the Declaration of Independence, born in Caroline County, Va. He was admitted to the bar in 1762, and soon acquired a reputation as an eloquent and successful pleader. In 1774 he removed to Granville County, N. C., and almost immediately became prominent there. Having espoused the Patriot cause, he was, in September, 1775, chosen a delegate to the Continental Congress, and next year signed the Declaration of Independence. He was rechosen delegate in 1777, and once again in 1779. In 1780, after the disastrous defeat of Camden, he was given almost dictatorial power in North Carolina, and did much to assist General Greene in his campaign against the invaders under Cornwallis. In 1784 he was appointed receiver of taxes for North Carolina by Robert Morris, but found his duties so disagreeable that he soon resigned.

PENN, Richard (c.1735-1811). A British colonial Governor in America, born in England. He was a grandson of William Penn, and was educated at Saint John's College, Cambridge. He began the study of law, but went to Pennsylvania in 1763, became a member of the Council in 1764, and remained, probably, until 1769. When his brother John, who was Lieutenant-Governor, returned to England in 1771, Richard was sent out in his stead, and served until August, 1773. He was very popular with both colonists and Indians. With Arthur Lee he carried the petition of the Congress to England. When examined before the House of Lords as to the ability and disposition of the colonists to resist the acts of Parliament, he was sharply reproved by the Ministers for his obvious sympathy with resistance. From 1784 until 1809, he represented various boroughs in Parliament.

PENN, Thomas (1702-75). A British colonial proprietor, son of William Penn, the founder of Pennsylvania. He was born in Kensington, and in 1718 succeeded to one-fourth of the proprietorship of Pennsylvania. In 1732 he went to Philadelphia. He held a power of attorney for his two brothers and assumed direction of the colony until the arrival of his elder brother, John, in 1734. He remained in the colony after his brother's return to England, presided at many of the council meetings up to 1739, and held a great conference with the Indians in 1740. In 1747, upon the death of his elder brother, he inherited the latter's half-interest, and went to England to take charge. During the French and Indian War he sent £5000 for the relief of the colony, having previously given money and land for the establishment of a public library in Philadelphia. When the dispute over taxation of the proprietary estates arose, he received Franklin, the agent of the colony, who brought the 'Heads of Complaint,' in 1757, and he vigorously opposed the petition of the colony, in 1764, that the Crown should assume charge. His interest was finally purchased by the State.

PENN, Sir William (1621-70). A British sailor, probably born in Bristol, England. He was brought up to the sea, and under the Commonwealth held many important naval commands. In 1649 he was appointed vice-admiral of the Irish fleet, and in 1650-51 cruised along the coast of Southern Europe and in the Mediterranean, seeking Prince Rupert. In 1652 he was appointed vice-admiral of the fleet under Gen. Robert Blake (q.v.), and participated in the victory off Portland (February 18, 1653), and those of June 3d and July 31st. After the conclusion of the Dutch War Penn entered into negotiations with the Stuarts, but these proving fruitless, he accepted the command of a fleet sent against the Spanish possessions in America, and on May 17, 1655, captured the island of Jamaica. In 1660 he was knighted by the King and appointed a commissioner of the navy. Five years later he won, though nominally under the command of the Duke of York, a victory over the Dutch near Lowestoft (June 3, 1665). Consult: Granville Penn, *Memorials of the Professional Life and Times of Sir William Penn*, and Dixon, *Life of William Penn*.

PENN, William (1644-1718). A celebrated English Quaker and the founder of Pennsylvania. He was the son of Sir William Penn, was born in London, and was educated chiefly at Christ's Church, Oxford, where he became a Quaker. His enthusiasm for his new faith assumed a pugnacious form. Not only did he object to attending the services of the Church of England and to wearing the surplice of a student—both of which he considered papistical—but, along with some companions, who had also become Quakers, he attacked several of his fellow-students, and tore the obnoxious robes from their backs. For this conduct Penn was expelled from the university. His father, although excessively annoyed at his conduct, sent him to travel on the Continent, where he became a frequent guest at the Court

of Louis XIV. After studying law a short time at Lincoln's Inn, he was sent by his father to Ireland to look after his estates in the County of Cork. In the city of Cork, however, he fell in with Thomas Lee, and for attending a Quaker meeting was, along with some others, imprisoned by the Mayor, though he was promptly released. He now became a minister, and on his return to England he and his father again quarreled, because his 'conscience' would not allow him to take off his hat to anybody—not even to the King, the Duke of York, or the Admiral himself. Penn was for a second time turned out of doors by his father, but his mother smoothed matters so far that he was allowed to return home, and the Admiral even exerted his influence with the Government to wink at his son's attendance at the illegal conventicles of the Quakers, which nothing could induce him to give up. Meantime he was engaged in preaching and writing tracts on various religious subjects. In 1668, however, he was thrown into the Tower, where he was confined for eight months on account of a publication entitled *The Sandy Foundation Shaken*, in which he attacked the ordinary doctrines of the Trinity. While in prison he wrote the most famous and most popular of his books, *No Cross, No Crown*, and *Innocency with Her Open Face*, a vindication of himself which contributed to his liberation through the interference of the Duke of York. In September, 1670, Admiral Penn died, leaving his son an estate of £1500 a year, together with claims upon the Government for £16,000. In 1671 he was again committed to the Tower for preaching in violation of the Conventicle Act, and, as he would take no oath at his trial, he was sent to Newgate for six months. Here he wrote four treatises, one of which, entitled *The Great Cause of the Liberty of Conscience*, is an admirable defense of the doctrine of toleration. After regaining his liberty he, together with Fox and Barclay, visited Holland and Germany for the advancement of Quaker interests. The Countess Palatine Elizabeth, the granddaughter of James I., showed him particular favor. On his return he again engaged in preaching and writing on religious topics, but circumstances soon turned his attention to the New World. In 1676 Penn and several associates founded a Quaker colony in West Jersey, which had come into their possession by purchase. In 1681 Penn obtained from the Crown, in lieu of a debt of £16,000 due from the King to his father, a grant of the territory now forming the State of Pennsylvania. By a royal charter he was made full proprietor of the territory of Pennsylvania. His great desire was to establish a home for his co-religionists in America, where they might preach and practice their convictions in unmolested peace. In the same year he sent out a governor to take possession of the province, and in the following year, 1682, with several friends, sailed for the Delaware, arriving in October. After taking formal possession he laid out a site for his new capital, which he named Philadelphia. Some time during the following year he had his famous interview with the Indians under the great Elm at Shakamaxon (now Kensington) and concluded a treaty of lasting friendship with them. Penn's colony in its infancy escaped the horrors of Indian warfare which befell some of the other American settlements, and under the wise and liberal government of its founder made immense progress during the next few years. Not only Quakers, but persecuted members of other religious sects, sought refuge in his new colony, where, from the first, the principle of toleration was established by law. Having called the colonists together, he gave the colony a constitution in twenty-four articles. Almost from the beginning Delaware, which was secured by a grant from the Duke of York, formed part of the Pennsylvania colony. In 1682 Penn and other Quakers bought East Jersey. Neither West Jersey nor East Jersey, however, remained permanently in the possession of the Quakers, the whole region being surrendered to the Crown in 1702. Toward the end of the reign of Charles II., in 1684, Penn returned to England to exert himself in favor of his persecuted brethren at home, leaving behind a prosperous colony of 7000 inhabitants. His influence with James II.—an old friend of his father—was so great that his exertions in favor of the Quakers secured in 1686 a proclamation by which all persons imprisoned on account of their religious opinions were released, and more than 1200 Quakers were set free. In the April following, largely as a result of the same influence, James issued an edict for the repeal of all religious tests and penalties, but the mass of nonconformists distrusted his sincerity, and refused to avail themselves of it. After the accession of the Prince of Orange as William III., Penn was twice accused of treason as a result of his relations with the exiled monarch, but was acquitted. In 1690 he was arrested on a charge of conspiracy, but was again acquitted for lack of evidence. Nevertheless in the following year the charge was renewed, and for a time he was deprived of the government of Pennsylvania. Nothing further appears to have been done for some time, but at last, through the kindly offices of his friends, Locke, Tillotson, and others, the matter was thoroughly investigated, and he was finally and honorably acquitted November, 1693, and restored to the government of his province. In 1699 he paid a second visit to the New World, and found Pennsylvania in a prosperous condition. His stay, which lasted two years, was marked by many useful measures, and by efforts to ameliorate the condition both of the Indians and of the negroes. Penn departed for England toward the end of 1701, leaving the management of his affairs to a Quaker agent named Ford, by whose dishonesty he was virtually ruined. When the agent died, he left to his widow and son false claims against his principal, and these were so ruthlessly pressed that Penn allowed himself to be thrown into Fleet Prison in 1708 to avoid extortion. His friends afterwards procured his release, but not until his health had been fatally impaired. Later he was stricken with paralysis and in this condition lingered until his death in 1718. He was twice married and left issue by both marriages. The works of Penn were published in 1782 in five volumes, and again in 1825 in three volumes. An important biography of Penn is that of Janney (Philadelphia, 1852). His *Memoirs*, in two volumes, were edited by Clarkson (Philadelphia, 1813). A biography refuting charges made against him by Lord Macaulay was written by Dixon (new ed., Philadelphia, 1856). A small popular biography is that by Hodges (Boston, 1901). Consult also Fisher, *The True William Penn* (Philadelphia).

WILLIAM PENN

AFTER THE PAINTING BY BENJAMIN WEST

PEN'NACOOK (nut place, or crooked place). A confederacy of Algonquian tribes formerly occupying the Merrimac River basin and adjacent region in New Hampshire, Massachusetts, and southern Maine. They occupied a middle ground between the Southern New England tribes, with whom the English had dealing, and the Abnaki and others of the north, who were under French influence. Their early treaties were with the English, but their later alliances were with the French. The capital of the confederacy and the residence of the head chief, Passaconaway, was at Amoskeag, the present Manchester, New Hampshire. Wamesit village, with Pawtucket Falls, was the great rendezvous during the fishing season. When first known to the English they were estimated at 3000, which was probably below their real number, under the rule of the noted chief and medicine man, Passaconaway. He was friendly to the whites and invited the English to settle upon the Merrimac. Before his death, about 1669, he saw almost his whole country in the hands of the whites and was himself obliged to petition for enough ground to live upon. In the mean time his people had been reduced by smallpox and other introduced diseases to about 1200. On the outbreak of King Philip's War in 1675, one or two of the Pennacook bands joined the hostile Indians, but the greater portion, under Wanalancet, the son of Passaconaway, remained on friendly terms with the English until, angered by the treacherous seizure of a number of their people, they abandoned their country and fled, part to the French in Canada, others to the Mohican on the Hudson. Those who removed to Canada were finally settled at Saint Francis, Quebec Province.

PENNAMITE-YANKEE WAR. See WYOMING VALLEY.

PENNANT (variant of *pennon*, with excrescent *t*, possibly associated by popular etymology with *pendant*, from OF., Fr. *pennon*, sort of flag, augmentative of OF. *penne*, from Lat. *penna*, feather, wing). A narrow flag or streamer tapering from the "hoist" to the "fly" or tip. In the signal codes pennants are two to five times as long as they are wide. The old commodores' 'broad pennant' was a 'swallow-tail' flag. The pennant of the 'senior officer present' is blue and nearly equilateral. The narrow pennant worn by all vessels commissioned in the Government service is carried at the main and signifies that she is of a public character. See Colored Plates of FLAGS OF THE UNITED STATES, and INTERNATIONAL SIGNAL CODE with the article SIGNALS, MARINE.

PEN'NANT, THOMAS (1726-98). A British naturalist, born at Downing, near Holywell, in Flintshire, and educated at Queen's College, Oxford. In 1754 he visited Ireland, and about this time began those tours of the British Islands, the published accounts of which contributed greatly to his reputation. In 1761 he began his *British Zoölogy*, the first part of which was published five years later. This work and his *History of Quadrupeds* (1781) were long held in the highest esteem by scientists. Among his other writings are: *Tour in Scotland* (1771); *Tours in Wales* (1810); *Arctic Zoology* (1784-87); and *Outlines of the Globe* (1798-1800). Consult: *The Literary Life of the Late Thomas Pennant, Esq., By Himself* (London, 1793); Parkins, *Memoir*, in Rhys's edition of the *Tours in Wales* (1883); and Jardine, *Memoir*, in "The Naturalists' Library," vol. xv.

PENNANT'S MARTEN. See FISHER.

PENNANT-WINGED NIGHTJAR. A nightjar (*Macrodipteryx vexillarius*) of equatorial Africa, in which one of the quill feathers in each wing is greatly elongated and has a vane only near the end. The bird is rare and little known; but has been observed in the daytime seated upon the ground with the two modified wing-feathers held perfectly erect, their feathery tips fluttering among the grass heads, from which they were scarcely to be distinguished. Compare STANDARD-WING.

PENN COLLEGE. A coeducational Friends' college at Oskaloosa, Iowa, founded in 1873, and comprising collegiate and preparatory courses, with departments of biblical instruction and a summer school. It had in 1902 an attendance of 242 collegiate and 124 preparatory students, 15 instructors, and a library of 6000 volumes. The college property was valued at $200,000, and the grounds and buildings at $150,000. The endowment was $100,000, with an income of $15,000.

PENNELL, pĕn'ĕl, JOSEPH (1860—). An American etcher, illustrator, and author, born in Philadelphia. He was a pupil of the Pennsylvania Academy of Fine Arts and the Pennsylvania School of Industrial Arts. He showed the picturesque possibilities of old Philadelphia in a series of clever etchings, and also executed many Italian and several English subjects, such as the "Thames Embankment," and the "Nelson Monument." He is one of the best of American etchers. His work is clean, strong, and intelligent, and is characterized by sharp contrasts of light and shade. He received honorable mentions and medals at Paris, Philadelphia, and Chicago, and a first class gold medal at the Paris Exposition of 1900. Some of the books which he illustrated, and the text for which usually was prepared by his wife, Elizabeth Robins Pennell, include *A Canterbury Pilgrimage* (1885); *An Italian Pilgrimage* (1886); *Our Sentimental Journey through France and Italy* (1888); *Pen Drawing and Pen Draughtsmen* (1889); *Our Journey to the Hebrides* (1889); *To Gipsy Land* (1893); *Modern Illustration* (1895); *The Illustration of Books* (1896); and *The Alhambra* (1896).

PENNI, pĕn'ē, GIANFRANCESCO, called 'Il Fattore' (c.1488-c.1528). An Italian painter, born in Florence. He was one of the favorite pupils and a friend of Raphael, and with Giulio Romano was his legatee and artistic executor. He painted from Raphael's designs in the Loggia of the Farnesina, and the Vatican, completed the "Coronation of the Virgin" for Montelucc, and copied the "Transfiguration" and the "Entombment." Besides these paintings he is said to have worked on the cartoons, and to have executed the "Visitation" in the Madrid Museum, and the "Madonna del Passeggio," in the Bridgewater Gallery, after Raphael's designs. His original work is of little importance.

PENNINE ALPS. See ALPS.

PENNINE CHAIN. A range of hills in Northern England. See GREAT BRITAIN.

PENNSYLVA'NIA (from *Penn* + Neo-Lat. *sylvania*, woodland, from Lat. *silvanus, sylvanus*, relating to a forest, from *silva, sylva*, wood, forest; named in honor of William Penn). A North

Atlantic State of the United States, situated at the apex of the arch formed by the coast States from North Carolina to New England, whence it is popularly called the 'Keystone State.' It lies between 39° 43′ and 42° 15′ north latitude, and between 71° 43′ and 80° 31′ west longitude. It is bounded on the north by New York State, and for about 50 miles in the west by Lake Erie, on the east by New York and New Jersey, on the south by a small part of Delaware and by Maryland and West Virginia, and on the west by West Virginia and Ohio. In shape it forms a rectangle. The north and south boundaries are straight lines running along parallels 157¾ miles apart, except for the small projection of the northwestern corner. The western boundary is a straight line running along the meridian, but the eastern boundary is formed by the Delaware River, which forms two large and regular zigzag bends, making the extreme length of the State 302 miles. The area is 45,215 square miles, of which 44,985 square miles, or 28,790,400 acres, are land surface. The State ranks twenty-ninth in size among the United States.

Topography. Three of the four topographical belts which form the Eastern United States may be recognized in this State, running across its territory from southwest to northeast. The Atlantic coastal plain does not come within the State limits, so that the first of the three belts is the Piedmont Plain (q.v.), which occupies the southeastern portion between the lower course of the Delaware and the Blue or Kittatinny Mountain range. It has a width of about 60 miles, and ascends by gentle undulations from sea-level at the Delaware estuary to an elevation of 500 feet at the base of the mountains. It is broken, however, by several low ridges in the southeast, and farther inland by the interrupted chain of semi-isolated groups of hills known as the South Mountain, which farther north becomes the Highlands of New Jersey and New York. The second belt is the Appalachian Mountain region. It crosses the State toward the northeastern corner as a system of more or less parallel ridges, together from 50 to 80 miles wide. The eastern ridge is the Blue Mountain, known farther north and in New Jersey as the Kittatinny Range. It rises abruptly from the plain to a uniform height of a little over 1000 feet, or about 1500 feet above the level of the sea. It is broken by but few river gaps, notably that of the Susquehanna (which pierces the entire mountain belt), and the Delaware Water-Gap, on the eastern boundary of the State. West of the Blue Mountain there follows a succession of low ridges bearing various names, and intersected here and there by transverse river valleys. They appear almost like waves on the ocean, turning their steep faces southeastward and sloping gently toward the northwest, and they inclose a number of fertile and populous valleys. North of the Susquehanna they pass in the west into irregular masses which merge with the western plateau, but in the southern half the undulating belt is sharply limited on the west by the high and steep face of the Allegheny Range. The western slope of the latter falls gradually toward the plateau, though it is flanked by a few minor ridges, the extreme western outliers of the system, chief among which is Laurel Hill in the southwestern part of the State. The highest point in the State is North Knob, 2684 feet above the sea. The third topographical region is the broad Allegheny Plateau, covering the entire western half of the State. Its horizon has an elevation of 1000 to 2000 feet, sloping gently to the south and west. But it has been reduced by erosion to a complicated hill-country, or rather valley-country, being intersected in all directions by river-valleys, some broad and open, others narrow, with abrupt slopes 500 to 800 feet deep. The line of 1000 feet elevation is only two to five miles from the shore of Lake Erie, so that there is here no lake-shore plain.

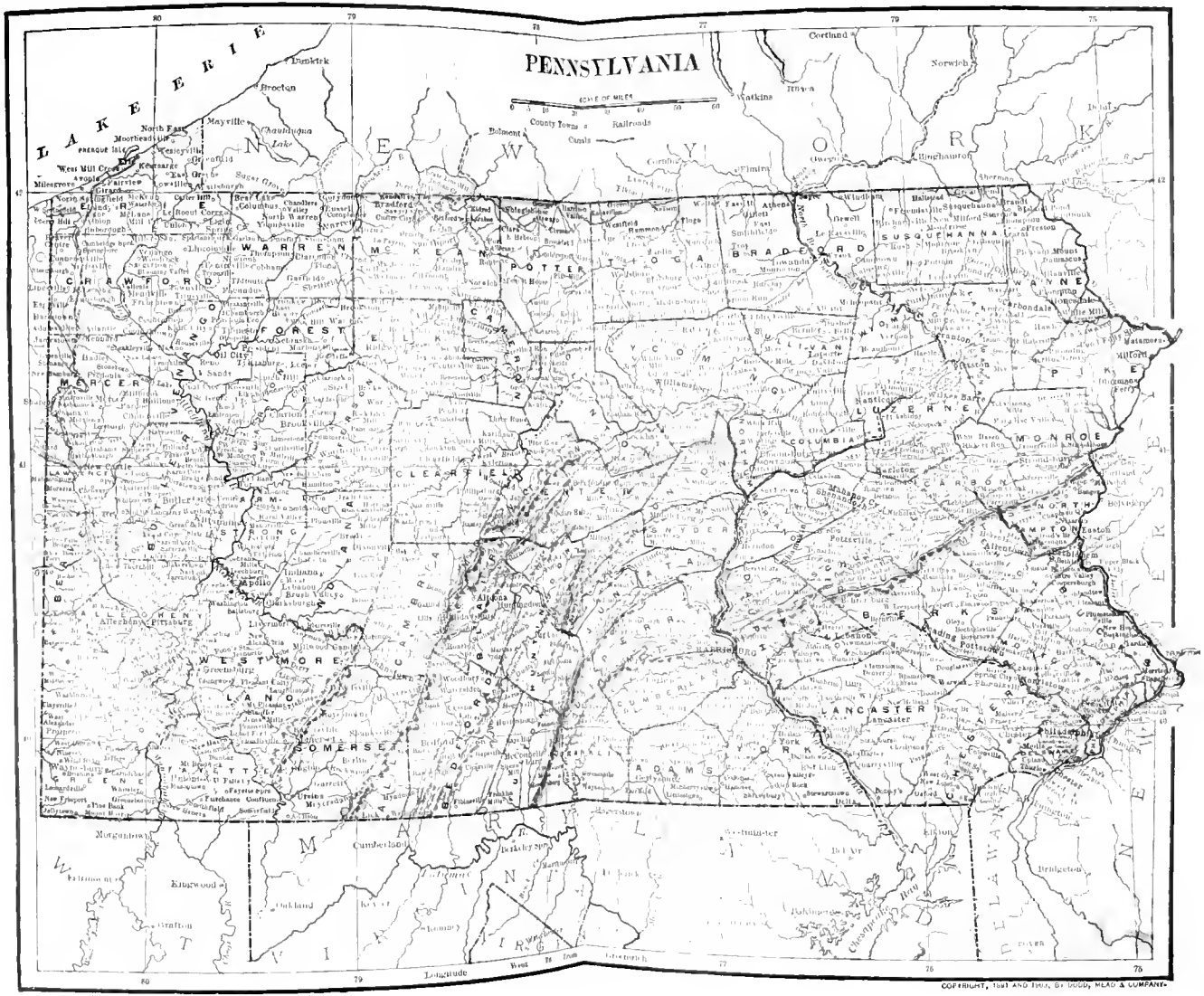
Hydrography. The three chief river systems are, in the order of their drainage areas, the Susquehanna, the Ohio, and the Delaware. These together drain over 90 per cent. of the State. An insignificant area in the south belongs to the Potomac system, and in the north to the Genesee, while the extreme northwestern corner is drained by short streams flowing into Lake Erie. The Delaware, which is navigable for the largest ships to Philadelphia, and for small steamers some distance above, drains the eastern slope through its right tributaries, chief of which are the Lehigh and the Schuylkill. The Susquehanna traverses the State in a large zigzag from north to south, receiving its two main tributaries, the West Branch and the Juniata, from the west. It is broad, but shallow and unnavigable. The western part of the State is drained by the Ohio and its two great headstreams, the Allegheny and Monongahela, both of which are navigable for some distance above their junction at Pittsburg.

Climate. The climate in the southeastern part along the Delaware is much warmer, both in summer and in winter, than in the western upland. The mean temperature for January at Philadelphia is 32.3°, and for July 76.2°. The corresponding figures for Wilkesbarre, among the mountains, are 27° and 72°; for Pittsburg, 31° and 75°; and for Erie, on the lake shore, 27° and 70°. The summer heat south of the Blue Mountain has been as high as 107°, and is prolonged far into autumn. Northwest of the mountains the snow sometimes lies several feet deep throughout the winter, and the temperature may fall to 28° below zero. The average annual rainfall for the State is 44.6 inches. It is evenly distributed both as to season and through the larger regions of the State, though it may range from 35 to 50 inches in isolated localities.

Soil and Vegetation. The soils are on the whole somewhat more fertile than those of the average Atlantic State, there being no Tertiary sand area, and comparatively small areas of primary rocks. The soil is to a large extent decomposed limestone material, which is a good grain soil, and, where least fertile, is well suited for pasturage. Pennsylvania was originally one of the most densely forested States, and there are still considerable forest areas on the western plateau. The predominating trees on the lowlands are white oak, hickory, chestnut, walnut, and cherry; on the higher ground are the white pine, hemlock, pitch pine, maple, beech, and black and yellow birch; and on the mountains above 1800 feet the black and red spruce, balsam fir, and larch predominate. On the western plateau the forests are mostly deciduous, with chestnut and oak abundant, and in the southwest the common trees of the State mingle with those characteristic of Kentucky, such as the honey locust and Kentucky coffee tree. The sugar-maple is

AREA AND POPULATION OF PENNSYLVANIA BY COUNTIES.

County.	Map Index.	County Seat	Area in square miles.	Population.	
				1890.	1900.
Adams	D 4	Gettysburg	527	33,486	34,496
Allegheny	A 3	Pittsburg	758	551,959	775,058
Armstrong	B 3	Kittanning	640	47,747	52,551
Beaver	A 3	Beaver	426	50,077	56,432
Bedford	C 4	Bedford	1,059	28,634	30,468
Berks	E 3	Reading	871	135,327	159,615
Blair	C 3	Hollidaysburg	530	70,866	85,049
Bradford	E 2	Towanda	1,140	50,233	59,403
Bucks	F 3	Doylestown	620	70,615	71,190
Butler	B 3	Butler	765	55,339	56,302
Cambria	C 3	Ebensburg	680	66,375	104,837
Cameron	C 2	Emporium	375	7,228	7,048
Carbon	F 3	Mauch Chunk	400	38,624	44,510
Center	D 3	Bellefonte	1,130	43,269	42,804
Chester	F 4	Westchester	760	89,397	95,695
Clarion	B 2	Clarion	596	30,802	34,283
Clearfield	C 3	Clearfield	1,141	69,565	80,614
Clinton	D 2	Lockhaven	892	28,685	29,197
Columbia	E 2	Bloomsburg	480	36,832	39,896
Crawford	A 2	Meadville	1,020	65,324	63,643
Cumberland	D 3	Carlisle	546	47,251	50,344
Dauphin	E 3	Harrisburg	514	96,277	114,443
Delaware	F 3	Media	178	74,683	91,562
Elk	C 2	Ridgway	760	22,220	32,903
Erie	A 1	Erie	782	86,074	98,473
Fayette	B 4	Uniontown	824	80,006	110,412
Forest	B 2	Tionesta	420	8,482	11,020
Franklin	D 4	Chambersburg	731	51,433	54,302
Fulton	C 1	McConnellsburg	416	10,137	9,924
Greene	A 4	Waynesburg	588	28,235	28,281
Huntingdon	C 3	Huntingdon	940	35,751	34,650
Indiana	B 3	Indiana	820	42,175	42,556
Jefferson	B 3	Brookville	620	44,005	50,173
Juniata	D 3	Mifflintown	398	16,655	16,054
Lackawanna	F 2	Scranton	470	142,088	208,831
Lancaster	E 3	Lancaster	940	140,005	150,241
Lawrence	A 3	Newcastle	360	37,547	51,042
Lebanon	E 3	Lebanon	370	48,131	53,825
Lehigh	F 3	Allentown	398	76,031	91,893
Luzerne	E 3	Wilkesbarre	910	201,203	257,121
Lycoming	D 2	Williamsport	1,240	70,579	75,663
McKean	C 2	Smethport	976	46,863	51,343
Mercer	A 2	Mercer	680	55,744	57,285
Mifflin	D 3	Lewistown	411	19,996	23,160
Monroe	F 3	Stroudsburg	630	20,111	21,161
Montgomery	F 3	Norristown	501	123,290	138,965
Montour	E 3	Danville	142	15,645	15,526
Northampton	F 3	Easton	370	81,920	99,687
Northumberland	F 3	Sunbury	469	74,698	90,911
Perry	D 3	New Bloomfield	561	26,256	26,203
Philadelphia	F 4	Philadelphia	130	1,046,964	1,293,697
Pike	F 2	Milford	620	9,412	8,506
Potter	D 2	Coudersport	1,049	22,778	20,621
Schuylkill	E 3	Pottsville	780	154,163	172,927
Snyder	D 3	Middleburg	320	17,651	17,304
Somerset	B 4	Somerset	1,040	37,317	19,161
Sullivan	E 2	Laporte	470	11,620	12,131
Susquehanna	E 2	Montrose	823	40,093	40,043
Tioga	D 2	Wellsboro	1,180	52,313	49,086
Union	D 3	Lewisburg	316	17,820	17,592
Venango	B 2	Franklin	671	46,640	49,648
Warren	B 2	Warren	860	37,585	38,946
Washington	A 3	Washington	830	71,155	92,181
Wayne	F 2	Honesdale	834	31,010	30,171
Westmoreland	B 3	Greensburg	1,060	142,819	160,175
Wyoming	E 2	Tunkhannock	402	15,891	17,152
York	E 4	York	875	99,189	116,413


PENNSYLVANIA
SCALE OF MILES
0 5 10 20 30 40 50 60
County Towns
Railroads
Canals
LAKE ERIE
NEW YORK
ERIE
CRAWFORD
WARREN
MCKEAN
POTTER
TIOGA
BRADFORD
SUSQUEHANNA
WAYNE
PIKE
MERCER
FOREST
VENANGO
CLARION
JEFFERSON
ELK
CAMERON
LYCOMING
SULLIVAN
WYOMING
LUZERNE
COLUMBIA
MONROE
LAWRENCE
BUTLER
ARMSTRONG
CLEARFIELD
CENTRE
UNION
SNYDER
NORTHUMBERLAND
CARBON
LEHIGH
NORTHAMPTON
ALLEGHENY
BEAVER
INDIANA
WESTMORELAND
CAMBRIA
BLAIR
HUNTINGDON
JUNIATA
PERRY
DAUPHIN
SCHUYLKILL
BERKS
LANCASTER
YORK
ADAMS
CUMBERLAND
FAYETTE
GREENE
SOMERSET
BEDFORD
FULTON
MARYLAND
DELAWARE
Longitude West from Greenwich
COPYRIGHT, 1887 AND 1905, BY DODD, MEAD & COMPANY.

still one of the most common trees all over the State.

For FAUNA see this section under UNITED STATES.

GEOLOGY. The great Archæan belt which forms the entire eastern flank of the Appalachian system from Alabama to Canada crosses the southeastern corner of the State in a band about 50 miles wide and consisting chiefly of gneisses with tracts of serpentine. It is exposed in two sections, one ending in a point near Trenton, and broadening southwestward along the Delaware, forming the hills near Philadelphia, the other running southwest from the confluence of the Lehigh River with the Delaware, and forming the South Mountain chain. Between these two outcrops the Archæan belt is crossed by a band of Triassic red sandstone, which runs northeastward and extends across New Jersey. Both this and the Archæan belts are crossed by numerous dikes of trap-rock. Against the western flank of the South Mountain rests the lowest stratum of the great Paleozoic series which covers the entire remainder of the State as well as the whole of the Ohio and Upper Mississippi Valley. On the western plateau these strata lie nearly horizontal, but in the Appalachian uplift they are much tilted, folded, and broken, so that they outcrop in narrow successive bands. Here the hard sandstone strata generally form the ridges, while the softer limestone forms the valley floors. The series begins with a narrow belt of Cambrian running along the edge of the Archæan outcrop. West of this, between the South and the Blue or Kittatinny Mountains, the Kittatinny Valley runs across the State as a belt of Lower Silurian limestone, from which rise the Appalachian ridges of Devonian rocks, with some belts of Silurian. The great Devonian area of southwestern New York extends across the whole length of the boundary, and is especially prominent in the northeastern part of the State. It is overlaid with Carboniferous strata, which, with the exception of the Triassic belt in the east, is the most recent formation in the State, and covers the entire southwestern and west central regions, with isolated patches east of the Susquehanna.

MINERAL RESOURCES. In these isolated Carboniferous areas in the Appalachian valleys the coal seams were subjected to metamorphosis by the folding and crushing action of the older strata during the great upheaval, and were changed into invaluable beds of anthracite, while on the western plateau, where the strata were undisturbed, they remained in the bituminous form. The underlying Devonian sandstone strata in the west are heavily charged with petroleum and natural gas. Iron is found as brown hematite in the Silurian slates in the region of the Lehigh River, and as magnetite in the metamorphic rocks, while it is also imbedded with the Carboniferous strata. Other minerals found are zinc, cobalt, nickel, lead, copper, tin, chrome iron, salt, and soapstone. White marble is quarried in the Silurian limestone beds, and building stone, such as the trap and red sandstone in the east, is abundant.

MINING. No State in the Union compares with Pennsylvania as to mining. Its mineral wealth has been in a large measure the basis of its diversified and highly developed industrial life. The annual output of coal alone exceeds in value the total mineral product of any other State, and has annually, since 1880, been equal in amount to that of all the coal mined in the other States. Anthracite has been mined continuously since 1820. The demand and the output rapidly increased, particularly after 1840, when it came into use for smelting iron ore. The annual output of anthracite coal much more than doubled in both bulk and value from 1880 to 1901. The amount in short tons for 1880 was 28,649,811; for 1890, 46,468,641; and for 1901, 67,471,667, the value for the year 1901 being $112,504,020. The anthracite coal fields of Pennsylvania yield almost the entire product for the United States, and represent the only high-grade anthracite producing region in the world. These mining districts fall principally into three sections in the northeastern part of the State—the Northern Field, in the Wyoming and Lackawanna valleys, the Middle or Lehigh and Mahonoy Fields, and the Southern or Schuylkill Field. The bituminous coal is mined chiefly in six parallel valleys west of the Allegheny slope, in the southwestern corner of the State. It was not until about 1875 that bituminous coal began to be extensively used in iron-smelting, but since then it has far exceeded anthracite in annual tonnage. The tonnage increased from 19,416,171 short tons in 1880 to 82,305,496 in 1901, the value for the latter year being $81,397,586. In 1900 there were 92,692 employees engaged in coal-mining.

Pennsylvania has always ranked first in the production of coke, usually yielding about two-thirds of the total for the United States. The yield increased from 2,821,384 tons in 1880 to 8,560,245 in 1890 and to over 13,000,000 tons in 1900. The coal used requires little or no preparation before charging into the ovens, and the greater part of it is unwashed run-of-mine. Nearly three-fourths of the total product of coke is made in the Connellsville district.

The utilization of petroleum in the United States began in Pennsylvania in 1859. The output increased almost constantly until 1882, when the yield was 30,053,500 barrels. This figure was not exceeded until 1891, when the output was 33,009,236 barrels. The yield has since fallen off over half, being 12,625,378 barrels in 1901, valued at $15,430,609. Prior to about 1885 Pennsylvania produced almost the whole product for the United States, and up to 1900 had produced 60 per cent. of the total output for the country. However, since 1894 Ohio has annually outranked Pennsylvania, and it was also outranked by West Virginia in 1900. The first oil pipe lines were laid in 1865, and have been extended until they reach numerous distant points. Natural gas became prominent as a fuel in Pennsylvania earlier than in other gas States, and its annual sales of gas exceed those of any other State. Gas came into general use from 1880 to 1885, reaching its climax in 1888, in which year the sales amounted to $19,282,375. As the supply in certain regions became exhausted, the receipts decreased to less than $6,000,000 in 1895 and 1896; but the growing scarcity has resulted in a considerable rise in price, and this fact has largely been responsible for a recent gain in receipts, which amounted in 1900 to $12,688,161.

Iron mining began early in the colonial period, and until 1850 the local product supplied the iron furnaces of the State with all the raw material required. And though the greater part of

the iron used in the latter part of the nineteenth century came from outside regions—especially the Lake Superior mines—the output within the State has not decreased, and Pennsylvania takes fourth rank among the iron-mining States. The yield in 1901 amounted to nearly 1,040,684 long tons, valued at $1,890,100. Over 771,000 tons were of the magnetite variety, for which the Cornwall hills, near Lebanon, are noted. Brown and red hematites and a small quantity of carbonate are also mined.

Pennsylvania is without a rival in the stone-quarrying industry. The values of the product in 1901 for limestone, slate, and marble, respectively, were $5,081,387, $2,984,264, and $157,547, each figure being larger than the corresponding one for any preceding year. The production of slate is about two-thirds that for the whole country. Pennsylvania also ranks first in the amount of limestone quarried. About two-fifths of the limestone is used for flux, and a somewhat less amount is burned into lime. The value of the granite for the same year was $396,271, but from year to year the value of the output fluctuates greatly. The value of sandstone has recently increased enormously, being put in 1901 (including bluestone) at $2,063,082, and giving the State second rank. Pennsylvania stands second in the value of its clay products and first in the output of brick, the value of which in 1900 was $12,000,875. The State produces in value over half the total product of Portland cement for the United States. This industry is rapidly developing, the value of the product having increased from $3,142,711 in 1898 to nearly $6,382,350 in 1901. Some rock cement is also produced. Other products worthy of note are metallic paint, mineral water, salt, and ochre.

Agriculture. Farming is carried on more or less extensively in all sections, there being many arable and fertile valleys, even in the more mountainous regions. Districts too hilly to be readily cultivated are admirably adapted for grazing. In the southeastern counties the soil is an exceedingly rich loam, and agriculture is highly developed. About 67 per cent. of the area of the State is included in farms, and of this 68 per cent. is improved. The area of improved land increased rapidly until 1880, since when it has not materially changed. The average size of farms decreased in each decade between 1850 and 1900, being reduced from 117 acres in 1850 to 86.4 in 1900. Seventy-four per cent. of the farms are operated by owners. Pennsylvania leads the Atlantic States in the production of cereals. It yields considerably over twice as much corn and about three times as much wheat as New York. The acreage for each of these in 1900 exceeded that in 1880 and in 1890. Oats, which are only a little less important, decreased slightly in acreage during the same period. Oats are grown most extensively in the eastern section, and corn and wheat in the southeastern. The State leads in the production of rye, and is exceeded by New York alone in the area of buckwheat, having over a third of the total acreage for the United States. The acreage of hay is greatly exceeded in New York and slightly in two or three Western States. Potatoes form one of the chief money crops. Other varieties of vegetables are also abundantly grown, particularly sweet corn and cabbage, the acreages separately reported in 1900 being respectively 12,879 and 10,851. Tobacco is a very important crop in Lancaster and York counties. Pennsylvania is a large producer of orchard fruits. Between 1890 and 1900 the number of trees increased 59.4 per cent., the increase in the peach trees being particularly noteworthy. Of the total number of trees, 11,774,211, or 66 per cent., were apple. Grapes and small fruits are grown in considerable quantities, and floriculture is extensively carried on.

The following table shows the acreages of the leading farm crops:

	1900	1890
Hay	3,269,441	3,323,689
Corn	1,480,833	1,252,399
Wheat	1,514,043	1,318,472
Oats	1,173,847	1,310,197
Rye	310,048	336,041
Buckwheat	249,840	210,488
Potatoes	227,867	291,992
Tobacco	27,760	26,655

Stock-Raising. The adaptability of the State for grazing has resulted in an extensive dairying industry. In every decade between 1850 and 1900 there was an increase in the number of dairy cows. Only three other States have a larger number, and in only one is the value of the product as great. The yield of milk in 1900 was 32 per cent. greater than in 1890. In 1900 $17,274,430 was received from the sale of milk, and $9,466,575 from the sale of butter. There was a large gain between 1890 and 1900 in the number of 'other neat cattle,' and of mules and asses, but a decrease in horses, swine, and particularly sheep. The annual income from poultry products is important. The following table of live-stock holdings is self-explanatory:

	1900	1890
Dairy cows	943,773	927,251
Other cattle	953,074	779,164
Horses	590,981	618,660
Mules and asses	38,635	29,563
Sheep	959,483	1,612,107
Swine	1,107,981	1,278,029

Manufactures. Between 1850 and 1900 Pennsylvania ranked second as a manufacturing State. In the development of the factory system proper as indicated by the amount of power used it easily ranks first. The per cent. of the wage-earning population increased from 6.3 in 1850 to 11.6 in 1900. Between 1890 and 1900 this increase amounted to 28.7 per cent. The value of manufactured products for 1900 was $1,834,790,860. Pennsylvania has the advantage of navigation on the ocean, Great Lakes, and the Mississippi River. The Mississippi system was of great moment in the early period of development, enabling Pennsylvania to supply the frontier with manufactured products, while the Lake system more recently played a similar important part in rendering accessible vast resources of raw materials. An important network of canals and canalized rivers also figured early, and an elaborate system of railways figured in the later period. Furthermore, the manufacturing interests have been carefully fostered by a number of societies, which owe much to the activities and inspiration of one man, Benjamin Franklin.

No other industry has contributed so greatly to the reputation of the State as that of iron and steel. Although it developed earlier in other

colonies, it was spoken of as 'most advanced' in Pennsylvania as early as 1756. In 1900 it furnished 54 per cent. of the total product for the United States. The localization of the industry is determined by the accessibility to ore and fuel, and consequently until about 1850 the industry was most extensive in the eastern anthracite coal and iron ore district. (Charcoal, however, had been universally used prior to 1840.) Since then the Pittsburg district, in the western part, has far surpassed the eastern district. This change is coincident with the substitution of bituminous coal and coke and natural gas for anthracite coal, and with the development of the Lake Superior ore region. The pig iron produced in 1900 by the use of bituminous coal and coke amounted to 76 per cent. of the total for the State. The ore used in this part of the State comes from the Lake Superior district, having the advantage of cheap water transportation. From 1890 to 1900 the increase in iron and steel was 64.2 per cent. Although the industry is largely centered in the towns of Allegheny County, it is important in almost every large town. The manufacture of Bessemer steel began in 1867. Within the last two decades, however, the Bessemer process has been largely supplanted by the open-hearth process.

In foundry and machine-shop products the State ranks first. For instance, it made in 1900 more than one-half the total number of steam locomotives made in the United States. Since 1845 locomotives of Pennsylvania make have been shipped in constantly increasing numbers

INDUSTRIES	Year	Number of establishments	Average number wage-earners	Value of products, including custom work and repairing
Total for selected industries for State	1900	15,665	478,780	$1,291,000,950
	1890	12,613	381,760	935,303,641
Increase, 1890 to 1900	.....	3,052	97,020	$355,697,309
Per cent. of increase	.....	24.2	25.4	38.0
Per cent. of total of all industries in State	1900	6.9	65.2	70.4
	1890	32.1	66.9	72.2
Iron and steel, total	1900	291	110,864	$434,445,200
	1890	311	92,473	264,571,624
Blast furnaces	1900	77	16,075	101,575,487
	1890	116	15,612	75,239,203
Rolling mills and steel works	1900	209	94,664	332,588,174
	1890	186	76,689	188,714,190
Iron and steel, pipe, wrought	1900	10	3,675	15,383,633
	1890	14	9,170	30,249,795
Foundry and machine shop products	1900	1,960	62,828	127,292,440
	1890	886	38,247	67,587,025
Electrical apparatus and supplies	1900	63	7,817	19,112,665
	1890	10	200	674,565
Cars and general shop construction and repairs by steam railroad companies	1900	144	28,554	43,065,171
	1890	61	22,649	28,769,728
Cars, steam railroad, not including operations of railroad companies	1900	11	5,840	19,290,910
	1890	15	4,545	10,080,722
Coke	1900	89	9,283	22,282,358
	1890	98	5,855	10,415,628
Textiles	1900	1,102	102,213	158,782,087
	1890	1,028	79,579	134,001,269
Boots and shoes, factory product	1900	146	9,144	13,235,933
	1890	158	7,616	10,354,850
Clothing, men's, factory product	1900	481	10,497	24,389,043
	1890	357	7,675	26,732,348
Clothing, women's, factory product	1900	230	8,311	11,694,580
	1890	80	2,989	3,903,596
Flouring and grist-mill products	1900	2,719	2,195	36,639,423
	1890	2,226	3,378	39,478,076
Slaughtering, total	1900	111	1,669	25,238,772
	1890	242	1,582	21,991,694
Cheese, butter, and condensed milk, factory product	1900	749	976	10,290,006
	1890	389	766	5,319,434
Liquors, total	1900	281	4,976	34,520,358
	1890	203	3,548	22,698,423
Liquors, distilled	1900	73	471	5,357,615
	1890	40	400	4,339,689
Liquors, malt	1900	208	4,505	29,162,743
	1890	163	3,148	18,358,734
Tobacco, total	1900	2,712	25,483	33,355,932
	1890	2,027	18,550	23,387,910
Leather, tanned, curried and finished	1900	254	13,396	55,615,003
	1890	410	10,956	49,931,716
Glass	1900	119	19,420	22,011,130
	1890	90	18,510	17,179,137
Petroleum, refining	1900	38	3,209	34,977,706
	1890	55	3,284	18,498,777
Sugar and molasses, refining	1900	7	1,249	36,163,817
	1890	10	1,459	46,599,754
Chemicals	1900	100	4,278	13,034,384
	1890	71	3,284	13,144,210
Printing and publishing, total	1900	1,705	16,991	36,455,629
	1890	1,487	15,009	34,408,493
Lumber and timber products	1900	2,338	33,510	35,749,965
	1890	1,948	19,598	29,087,970
Lumber, planing mill products, including sash, doors, and blinds	1900	542	7,472	16,736,889
	1890	467	7,888	18,398,688
Paper and wood pulp	1900	73	4,840	12,267,900
	1890	72	2,951	7,858,299

to other countries. Also important is the production of iron and steel pipe and electrical apparatus and supplies, the latter industry having grown up almost entirely since 1890. The same advantages, together with the large railroad interests of Pennsylvania, have led to the most extensive car-construction and general shop works of steam railroad companies of any State. Altoona, Reading, and Philadelphia are the chief centres of this industry.

An entirely different group of industries, less dependent upon the material resources of the State, is the manufacture of textiles, in which the State takes second rank. Philadelphia, the principal seat of the industry, is the largest textile centre in the country. In 1900 the silk product amounted to 29 per cent. of the total for the United States, and the State was exceeded only by New Jersey. In recent years the operations are confined largely to 'throwing,' the thrown silk being sent to other States to be woven into cloth. Pennsylvania ranks second in the manufacture of woolen goods and hosiery. Both industries were begun at an early period, the former having been introduced by the English and the latter by the German settlers. A lower rank is held in the manufacture of worsteds and cottons. In 1900 Pennsylvania manufactured 48 per cent. of the total carpet product of the United States. More ingrain carpets are probably made in Philadelphia than in any other city in the world.

The agricultural resources supply materials for the flour and grist milling, slaughtering, and butter-making industries, and the manufacture of liquor and tobacco products. Prior to the Whisky Rebellion in western Pennsylvania large quantities of distilled liquors were made in that part of the State, but more recently the product is mainly malt liquors, in the output of which the State took second rank in 1900. The tobacco products are mainly cigars and cigarettes, the State ranking second also in this industry. The large tanning business, in which Pennsylvania stands first, with 27.3 per cent. of the total product for the United States, is due to the large quantities of hemlock bark attainable from the large forests of this tree. The manufacture of glass is a long established industry. The utilization of natural gas in the western part of the State gave great impetus to its manufacture. In 1900 the product amounted to 38.9 per cent. of the total for the country. The resources of petroleum have given the State first rank in the refining of oil. Pennsylvania has always held an important rank in the printing and publishing business. Other important industries are sugar and molasses refining, and the manufacture of chemicals. The preceding table shows the relative importance of the leading industries. It will be seen that the per cent. of increase for the value of products is more than twice as great as the per cent. of increase for the number of establishments. Among the industries showing the greatest tendency toward centralization are those connected with the production of iron and steel, coke, and leather.

Forests and Forest Products. Pennsylvania has always been one of the leading States in the lumber industry. In 1900 three of the lake States exceeded it in the value of lumber products, but for more than half a century Pennsylvania had taken a higher rank, being first in 1860. The figure in 1900, however, exceeded that of any previous census year. The manufacture of wood pulp is growing in importance, as shown in the table above, but the planing-mill industry scarcely holds its own. The woodland has been reduced (1900) to about 23,000 square miles, or 51 per cent. of the total area, and the merchantable timber has been removed from a large part of the region specified as woodland. The hemlock is the most abundant merchantable species and the one most extensively drawn upon at present. The white pine is next in importance. Hard woods are common in the southeast corner of the State.

Transportation and Commerce. Pennsylvania is exceeded in railroad mileage by only one other State. There was an increase from 2598 miles in 1860 to 8638 miles in 1890 and 10,310 miles in 1900. For the fiscal year ending in 1900 the number of passengers carried was 216,603,748 and the receipts per passenger per mile averaged 1.852 cents. During the same year there were 478,684,683 tons of freight carried, for which the receipts per ton per mile averaged .6 of a cent. A large number of the smaller lines have fallen into the hands of the Pennsylvania Railroad, which operates 2912 miles in the State.

Other important roads are the Philadelphia and Reading; the Lehigh Valley; the Pittsburg, Cincinnati, Chicago and Saint Louis; the Baltimore and Ohio; the Erie; the Philadelphia, Wilmington and Baltimore; the Delaware, Lackawanna and Western; the Western New York and Pennsylvania; and the Pittsburg, Fort Wayne and Chicago. The canal and slack-water navigation facilities are mostly controlled by railroad and coal-mining corporations. The State expended large sums in canal construction, but the rapid extension of the railroad system has caused many such waterways to be abandoned.

Philadelphia and Erie are the ports of entry, and control a considerable amount of foreign commerce. Philadelphia ranks third among the Atlantic Coast ports in the value of its foreign trade. Erie has one of the best harbors on Lake Erie, and carries on a large import trade in Michigan iron and Canadian lumber, and exports large quantities of coal. Pittsburg also, at the eastern head of navigation on the Western rivers, has an immense inland trade, while its local shipyards build large numbers of steamboats for use on the Western streams.

Banks. The Bank of North America, originally chartered by Congress in 1781, was the first bank in Pennsylvania, where it obtained a charter in 1782. In 1793 the Bank of Pennsylvania was incorporated as the official agent of the State, which was heavily interested in it. A few other banks were chartered by individual acts of the Legislature. In 1814 there were six banks, and the State owned stock in the most important ones. In 1814 the State policy toward the banking business underwent a radical change. The Commonwealth was divided into twenty-seven banking districts, each of which was allotted a definite number of banks. Unincorporated banking was prohibited and a comprehensive banking law passed. This could not avert the injurious results of the speculative inflation, and in 1816 many banks had to suspend specie payments. Banking became the object of popular disfavor and was held responsible for the critical times. A law

was passed in 1819 providing for forfeiture of charter in case of suspension of specie payments, and it somewhat reduced the number of banks. The period of extensive internal improvements that followed stimulated the banking business as well as all other business of the State, and for ten years the banks were exceptionally prosperous. In 1836 the second United States Bank, at the expiration of its national charter, became a Pennsylvania State institution, paying heavily for the privilege. The crisis of 1837 again caused a suspension of specie payment, and in 1840 after a hard struggle the United States Bank failed, ruined by its heavy investments in the State improvements and its heavy contributions to the State treasury. This failure, together with financial difficulties of the State treasury between 1840 and 1845, was felt by the other banks, and the stocks of most of them were sold far below par. Efforts were made to correct this by special legislation, by the levying of a tax on banking stock below par, and by making specie payments obligatory; but this last provision was frequently suspended by necessity. A slight improvement between 1850 and 1855 was followed by the severe crisis of 1857, when several Pennsylvania banks failed and a general suspension followed.

An agitation for a free banking system, with guaranteed circulation, was started, and in 1860 a free banking act was passed which was very similar to the New York Banking Law of 1837, but before the value of this act could be tested the national banking system came into existence. There was a marked demand for the national charters, which were supposed to exempt the banks from State taxation. By 1868 only 12 State banks remained, as against 198 national banks. In 1870-73 more than 90 State banks were chartered by special acts, but the Constitution of 1874 prohibited the organization of banks, except under the general law. At present State banking is regulated by the law of 1876 as amended in 1891, when a Banking Department was established. National banks remain by far the more important ones. Trust companies are conducted mostly in conjunction with the banks, and take care of business which the law prohibits the banks from doing. Savings banks have existed in Pennsylvania for almost a century. The first savings bank was chartered in 1819. Before the Civil War there were 14 of them. A general law for their regulation, strictly limiting their avenues for investment, was passed in 1889. A clearing house was established in Philadelphia in 1858, or five years later than the one in New York. The condition of the banks in 1902 is shown as follows:

	National Banks	State Banks	Trust Companies	Private Banks	Savings Banks
Number	550	105	158	23	13
Capital	$68,501,000	$9,460,000	$22,797,000	$920,000	
Surplus	70,455,000	8,990,000	36,829,000	361,000	$8,294,000
Cash, etc	51,394,000	2,779,000	7,758,000	445,000	2,453,000
Deposits	453,710,000	100,165,000	259,327,000	7,424,000	120,441,000
Loans	447,736,000			6,630,000	

There were 396,877 depositors in the savings banks and the average deposits amounted to $303.

Constitution and Government. The State Government was organized in 1776. The convention, of which Benjamin Franklin was president, signed the State Constitution September 28th of that year. In 1790 a new Constitution, of a more democratic cast, was adopted. The Constitution, as amended in 1838, vested the legislative power in a General Assembly, consisting of a Senate and a House of Representatives. An amendment to the Constitution, adopted in 1850, made the judiciary elective. An amended Constitution was adopted in 1873, by a popular vote of 253,744 against 108,594, and went into force January 1, 1874. If a proposed amendment receives a majority vote of both Houses at two successive regular sessions, it will be submitted to the people, and if approved by a majority of those voting, it becomes a part of the Constitution. No amendments can be submitted oftener than once in five years. A voter must have been a citizen of the United States one month, a resident of the State one year, and of the election district two months, and have paid State or county taxes. No elector can be deprived of the privilege of voting because he has not registered. The general election is held annually on the Tuesday next following the first Monday in November. The State has thirty-two members in the National House of Representatives.

Legislative. The Senate is limited to 50 members chosen for four years, and the House to a varying number, apportioned after each Federal census, chosen for two years. No city or county is entitled to more than one-sixth the whole number of Senators. Sessions are biennial, on the first Tuesday of January, without time limit. The Governor is empowered to call extra sessions for urgent business, and required to do so in case of a vacancy in the office of a United States Senator occurring during the recess. No bill can contain more than one subject, and revenue bills must originate in the Lower House. The power of impeachment rests with the Lower House, the trial of impeachment with the Senate.

Executive. The executive department consists of a Governor and a Lieutenant-Governor, both elected for four years, and a Secretary of Internal Affairs, an Auditor-General, elected for three years, and a Treasurer, elected for two years, an Attorney-General, a Secretary of the Commonwealth, and a Superintendent of Public Instruction, appointed for four years by the Governor, with the consent of two-thirds of the Senators. The Governor is not eligible for two consecutive terms. He is empowered to commute sentences and grant pardons within clearly defined limits, and vested, besides the ordinary veto powers, with the prerogative of a partial veto on appropriation bills. The department of the Secretary of Internal Affairs embraces a bureau of industrial statistics, and maintains the supervision of corporations, charitable institutions, and the agricultural, mineral, timber, and other interests of the State. The Lieutenant-Governor and the president pro tempore of the Senate are in the line of succession to the Governorship in case of vacancy.

JUDICIARY. The judiciary embraces a Supreme Court, consisting of seven judges, elected by the people for 21 years, ineligible for reëlection, with the judge the oldest in commission as Chief Justice. The court holds annual sessions at Philadelphia, Harrisburg, Sunbury, and Pittsburg. Other courts are a Superior Court, courts of common pleas, of oyer and terminer and general jail delivery, of quarter sessions of the peace, magistrates' and orphans' courts. Judges of the Supreme Court, and those of the Common Pleas, are justices of oyer and terminer and general jail delivery in the respective counties; the latter discharge also the functions of judges of quarter sessions of the peace and of orphans' courts in districts where special provision for them has not been made. Criminal matters of the respective districts belong likewise to their cognizance. There are 51 judicial districts in the State, in each of which the people elect one or more common pleas judges for ten years.

LOCAL GOVERNMENT. The creation of new or alteration of old counties is conditioned on a minimum population limit of 20,000 and a minimum area limit of 400 square miles for all counties affected. Each county elects sheriffs, coroners, prothonotaries, register of wills, recorder of deeds, treasurer, surveyor, clerk, three auditors, and three commissioners, all for three years. Towns of over 10,000 may be chartered upon the approval of one-half the electors. The State has classified the cities for charter purposes into four classes.

FINANCES. The first direct State tax was levied in 1785, but was discontinued in 1789. Taxes were very unpopular and the State expected to cover its expenditures by income from public property, sale of public lands, etc. Some taxes were introduced in the beginning of the nineteenth century, but in 1810 the revenue from them amounted only to 20 per cent. of the total receipts. In 1825 there were no direct State taxes. About this time the construction of public improvements, which had been going on in a quiet way since 1789, became the cry of the day. Loans were the only available source of necessary means. In 1821 the public debt incurred during the War of 1812 amounted only to $1,230,000, but new loans followed one another in great rapidity. Canals, roads, bridges, and railroads were built. Between 1789 and 1828 more than $22,000,000 was spent on these improvements. In 1834 the system of canals and railroads to connect Pittsburg and Philadelphia was completed at the cost of more than $14,500,000, and lateral canals were added in 1838 at the cost of almost $6,500,000. The large sum (more than $12,000,000) which the United States Bank furnished in 1837, partly as a bonus and partly as a loan to the State, in exchange for a State charter, further stimulated this feverish activity. The State debt was $24,500,000 in 1835 and in 1842 reached $40,000,000. Expecting large returns from these improvements, the State did not provide a thorough system of taxation. Interest had to be paid by means of further loans. The credit of the Commonwealth was therefore so much impaired in 1840 that failure was threatening. The income from the improvements did not even cover their expenses, and a law was passed in 1840 imposing small taxes on banks, personal property, and salaries. The revenue from this law did not cover even a tenth part of the expenditures, and the interest on the bonds continued to be paid by issue of special bonds. In 1844 a radical change was made in the financial system. A comprehensive tax was imposed upon all property, stocks, incomes, etc., and cash payment of interest was resumed the next year. For 15 years the debt remained on the same level; the State was not able to cancel any of its obligations and kept on refunding the maturing bonds. In 1857 and 1858 the State works, which were built at the expense of over $75,000,000, were sold for $11,000,000 to the Pennsylvania Railroad Company and Sunbury and Erie Railroad Company, and a gradual reduction of the State debt dates from that time.

In 1860 the debt decreased to $38,000,000, but the military loan of 1861 increased it by $3,000,000. A steady decline came after the war. In 1870 the debt was $28,980,071; in 1880, $21,561,990; in 1890, $12,349,920; and from 1895 to 1902 it remained $6,815,299. In 1902 bonds to the amount of $2,008,650 were bought at a nigh premium by the sinking fund and the debt was reduced to $4,806,649, against which the sinking fund had $4,432,023. These results were only possible by vigorous taxation. The law of 1844 taxed all property, but real estate was released from State taxation in 1867. The income tax survives, but contributes a trifling sum. The taxes on personal property and inheritances are productive of more revenue. The main sources, however, are the taxes on corporation stocks and receipts and various licenses, Pennsylvania having introduced the high-license principle.

During the fiscal year 1901-02 the receipts were $22,947,890 and expenditures $17,787,106. Discounting the operations of the sinking fund, the receipts were $19,374,093, and the expenditures $15,210,793. The cash balance in the sinking fund was $3,717,440, and in the general fund $9,151,366. Of the expenditures more than 50 per cent. was for schools and 17 per cent. for charitable institutions.

MILITIA. In 1900 there were 1,405,916 men of militia age. The number of the militia in 1901 was 9343.

POPULATION. The following figures show the growth of the population: 1790, 434,373; 1820, 1,047,507; 1850, 2,311,786; 1860, 2,906,215; 1870, 3,521,951; 1880, 4,282,891; 1890, 5,258,014; 1900, 6,302,115. The State has nearly always ranked second in population. The absolute increase in each decade has been greater than that of the decade preceding. The per cent. of the increase between 1890 and 1900 was 19.9, as compared with 20.7 for the United States. The State ranks second in the number of foreign born, with a total of 985,250. This element is not so greatly centralized in the large cities as in some of the other Eastern States, being found in large numbers in the mining districts. The Irish, Germans, and English are the most numerous; but there are, besides, a larger number of Welsh and natives of Hungary than in any other State. In 1900 the negroes numbered 156,845. Of the total population 51 per cent. is urban—i.e. they live in places which contain over 4,000 inhabitants, there being, in 1900, 119 such places, or more than in any other State. The average number of inhabitants to the square mile in 1900 was 140.1.

CITIES. The population of the 18 largest cities in 1900 was as follows: Philadelphia, 1,293,697; Pittsburg, 321,616; Allegheny, 129,896;

Scranton, 102,026; Reading, 78,961; Erie, 52,733; Wilkesbarre, 51,721; Harrisburg, the capital, 50,167; Lancaster, 41,459; Altoona, 38,973; Allentown, 35,416; Johnstown, 35,936; McKeesport, 34,227; Chester, 33,988; York, 33,708; Williamsport, 28,757; Newcastle, 28,339; Easton, 25,238.

RELIGION. The Roman Catholics form over one-eighth of the population. The principal Protestant denominations are the Methodist, Presbyterian, and Lutheran, each with over one-sixth of the total number of church members. Then follow in order the Baptists, the Protestant Episcopalians, the Disciples of Christ, and the Congregationalists.

EDUCATION. The first settlers of Pennsylvania, the Swedes and the Dutch, usually relegated the matter of education to the ministers. William Penn, in his Frame of Government, provided that the "Governor and Provincial Council shall erect and order all public schools" and "that the children within this province of the age of 12 years shall be taught some useful trade or skill." This provision was subsequently strengthened by the clause in the second Frame, adopted by the second Assembly in 1683, which provided for compulsory instruction in reading and writing, as well as in some manual trade. With the passing of the control of the colony from the hands of the Quakers, education received very little attention from the Legislature. It was left entirely to the Church and private initiative during the first three quarters of the eighteenth century. Private schools were meanwhile being established all over the province, and the agitation for a higher educational institution in Philadelphia, carried on by Benjamin Franklin, resulted in the foundation of the Academy and Charitable School of the Province of Pennsylvania (now University of Pennsylvania) in 1749. The first free public schools in Pennsylvania were opened by the settlers from Connecticut in 1769. The provisional Constitution of 1776 provided for the establishment of a school in each county, but it was only in 1834 that a free school system was successfully established.

The public school system is under the supervision of a State Superintendent, appointed by the Governor. The county superintendents are elected by the school directors, and the latter are elected by the people. Pennsylvania has no permanent school fund, the school revenue being obtained principally from local taxations and State appropriations. School attendance is compulsory between the ages of 8 and 16, and text books are free. In 1900 Pennsylvania had illiterates amounting to 6.1 per cent. of the total population of 10 years of age and over, being 2.1 per cent. for the native white population, 19.9 per cent. of the foreign white, and 15.3 per cent for the colored population. Of the school population 68.22 per cent. were enrolled in the public schools in 1901. The number of public schools in the same year was 29,046, including 16,625 graded, and the average attendance was 847,445, or about 73 per cent. of the total enrollment. In the same year there were employed in the public schools 30,044 teachers, of whom the male teachers formed 30.6 per cent., as against 45.5 in 1880. The average monthly salaries were $44.14 for male and $38.23 for female teachers, being considerably below the salaries paid in most of the North Atlantic States. Also the length of the school term was 165.6 days in 1901, as compared with an average of 177.2 days for the entire North Atlantic division. An attempt to solve the rural school problem by centralization has so far been attended with little success, owing to the poor condition of the roads. Pennsylvania suffers in common with other States in the low professional standing of the teachers, especially in the rural districts. For normal education the State maintains thirteen normal schools, which had a total attendance of 7987 in 1901, including 4664 female students. In that year the school revenue amounted to $26,159,774, consisting of $5,250,000 derived from State taxes, $15,482,898 from local taxes, and $5,426,876 from other sources. The expenditure amounted in the same year to $22,813,395, or $26.92 per pupil in average attendance. The 391 public schools had a total attendance of 32,438 in 1901. In the same year there were in the State 137 private high schools and academies, with a total attendance of 11,236. Commercial and professional education is provided by numerous commercial colleges, schools of law, medicine, dentistry, etc., and theological seminaries.

The principal institutions of higher education, besides the University of Pennsylvania, are the Western University of Pennsylvania (non-sectarian), at Allegheny; Lafayette College (Presbyterian), at Easton; Lehigh University (nonsectarian), at South Bethlehem; Bucknell University (Baptist), at Lewisburg; Dickinson College (Methodist Episcopal), at Carlisle; Haverford College (Friends), at Haverford; Swarthmore College (Friends), at Swarthmore; Pennsylvania State College, at State College; and Washington and Jefferson College (Presbyterian), at Washington. The principal college for women is Bryn Mawr (q.v.).

CHARITABLE AND PENAL INSTITUTIONS. The State maintains hospitals for the insane at Harrisburg, Danville, Norristown, Warren, Dixmont, and Warrensville, which together with the State aided asylums contained 7411 inmates on September 30, 1900. On the same date the hospitals for the sick and wounded, and homes for children, etc., held a population of 21,665. The four institutions for the deaf contained 408 persons, the two blind asylums 271, and the two institutions for feebleminded 1655. The almshouses for that date had a population of 12,168. The State maintains a soldiers' and sailors' home at Erie. There are State penitentiaries located at Philadelphia and at Allegheny, a House of Correction at Philadelphia, a Workhouse in Allegheny County, a House of Refuge at Philadelphia, a Reform School at Morganza, and an Industrial Reformatory at Huntingdon; the aggregate population of these institutions together with the 3493 inmates of county jails was, in 1900, 9108. The aggregate for all classes remaining in institutions September 30, 1900, was 41,908. Besides those, about 40,800 had received public outdoor relief during the year. The total public expenditure incurred for all the foregoing was $16,050,406. The foremost Indian training school in the country is maintained by the National Government at Carlisle.

HISTORY. Henry Hudson in the *Half Moon* anchored in Delaware Bay, August 28, 1609, and founded the Dutch claim to the bay and river, though he did not land. After 1614 exploring parties were sent out and trading posts founded on the eastern side of the river. Gustavus Adolphus, of Sweden, planned to found a colony in

America, and under his daughter, Queen Christina, Peter Minuit, formerly Governor of New Netherland, built Fort Christina within the present limits of Delaware, in 1638, and began to trade with the Indians. John Printz arrived with other colonists in 1643, and built New Gottenburg on Tinicum Island, the first settlement within the present limits of Pennsylvania. The Dutch looked with jealousy upon these and other Swedish settlements afterwards founded, and to offset the advance made by the Swedes, built Fort Casimir, at the site of the present town of New Castle, Del. This was captured by the Swedes in 1654; but in September, 1655, Governor Stuyvesant, of New Netherland, appeared in the bay with seven vessels and overthrew the Swedish authority. The city of Amsterdam had furnished much of the money for this conquest, and in return the southern settlements were assigned to that city under the name of New Amstel. The 'Company' colony was left in charge of Governor Stuyvesant, but in 1663 the two were reunited. When the Duke of York took possession of New Netherland in 1664 the settlements on the Delaware were included and remained attached to New York until 1682. On March 4, 1681, William Penn (q.v.), in return for a debt of £16,000, owed to his father by Charles II., secured a grant of the territory west of the Delaware River between 40° and 43°, extending to the west five degrees, at an annual rent of two beaver skins and one-fifth of the gold and silver ore discovered in the region. As New Castle was supposed to be on or near the 40th degree, the eastern boundary was to begin where a circle, having its centre at that settlement, twelve miles in radius, intersected the Delaware River and the southern boundary at the point where that circle intersected the 40th degree. Full feudal rights, both to the soil and to the government, were granted. On December 6, 1682, Penn secured from the Duke of York the grant of the soil of the lower settlements, and by consent assumed governmental rights. These settlements were within the original Maryland patent, but Lord Baltimore complained in vain. They remained attached to Pennsylvania, though with separate legislatures after 1703, until the Revolution, under the names 'the Lower Counties' or 'the Territories.' The southern boundary caused much trouble later. When it was found that the 40th degree was north of the present site of Philadelphia, the ingenious theory was announced that the beginning of the 40th degree was at 39°. The matter was finally settled by a compromise in 1760 (see MASON AND DIXON'S LINE), when also the northern boundary was fixed at 42°.

Upon receiving the grant Penn sent over his kinsman, William Markham (q.v.), as Deputy Governor, and followed himself in 1682, arriving at Uplands (now Chester) October 27th. A few days later he concluded a treaty with the Indians, though the purchase of the lands could not have taken place until later. The 'Frame of Government' previously published in England was submitted to the first General Assembly in December, 1682, and was adopted together with the 'great law,' made up largely of the suggestions of the Proprietor. Universal suffrage and entire religious toleration made the scheme notable. Settlers came over in great numbers, chiefly Quakers and Germans from the Palatinate. Philadelphia, which had been planned before Penn left England, grew rapidly, and before 1683 contained more than five hundred inhabitants, while more than 3000 settlers had come to the province. Land was offered at forty shillings the hundred acres, subject to a quit rent of a shilling a year. Penn returned to England in 1684, leaving the Council in charge, but its authority was soon disputed by the Lower House, which had a veto power on legislation, though it could not originate measures. Slanders were circulated in England, and in 1693 the province was resumed by William III., and attached to New York. Governor Fletcher met with little success in his attempts to secure aid for his Indian wars, and had several contests with the Legislature. The province was restored to Penn in August, 1694, and in 1696 a new and more democratic constitution was adopted with the Proprietor's consent. Penn's second and last visit to the province lasted from December, 1699, to October, 1701. During this time he granted the 'Charter of Privileges,' adopted October 26, 1701, which served as a constitution until the Revolution. The governors whom Penn appointed were involved in frequent disputes with the Assembly, and in consequence the Proprietor grew discouraged. In 1712 he was on the point of selling the province to the Crown for £12,000, but a paralytic stroke prevented the completion of the sale. Though the province was a constant source of expense to him, it made his descendants rich. After Penn's death in 1718, the disputes between the Assembly and the Proprietors continued with renewed vigor.

Immigration was large. There were Scotch-Irish in the province as early as 1698, and after 1730 they came in great numbers. These generally pushed on to the frontier, as did also the later influx of Germans. The first years were free from Indian warfare, but after 1740 the Indians were restless and soon became openly hostile. The efforts of the French were successful, and forts were established on the Ohio. The province sent few men to the aid of General Braddock in his expedition against Fort Duquesne in 1755; but his defeat aroused the Assembly, and a chain of forts was erected at a cost of £85,000. Until after 1764 danger from the Indians was constant. Meanwhile, in 1753, Connecticut laid claim to a tract of land on the Susquehanna, seventy miles west of the Delaware, under the charter of 1662, which granted to Connecticut the land to the 41st degree. A company was formed, the land was purchased from the Indians in 1754 (though previously purchased by Pennsylvania), and Susquehanna County was formed. Settlers went in and the formation of a distinct colony was considered. The Indians claimed that the purchase was made by fraud and protested vigorously. Armed forces were sent from eastern Pennsylvania and brought on the so-called Pennamite War; the dispute had its influence in causing the Wyoming Massacre in 1778. See WYOMING VALLEY.

The colony's agent, Benjamin Franklin, vigorously resisted the Stamp Act, and in July, 1774, a Provincial Congress met at Philadelphia, adopted resolutions, and elected delegates to the first Continental Congress, to be held at Philadelphia. The Provincial Convention in 1775 authorized the Committee of Safety to prepare a system of defense for the colony. Troops were raised

and boats were built. After the Declaration of Independence the Proprietary government ceased in Pennsylvania, and a State constitution was drawn up, September 28, 1776. It provided for a Supreme Executive Council, one Legislative House, and a Board of Censors. The Royal Charter was annulled by the King in 1778, and the State secured the commutation of the quit-rents in 1779. During the Revolution the eastern part of the State was the scene of important operations. Philadelphia was at different times the seat of the Continental Congress and the British headquarters. The question of the western boundary was settled in 1784, with the consent of Virginia, by measuring five degrees west from the Delaware River and then due north. The possession of the Wyoming lands was given to the State by decision of Congress in 1782, but when it was found that the line of 42° excluded Lake Erie, Congress, in 1788, authorized the addition of the triangle bordering upon the lake. In 1787 the State ratified the Federal Constitution. In 1790 a new constitution was adopted. The growth and prosperity of the State was marked, though the population was turbulent. The Whisky Rebellion (1794) grew out of the unwillingness of the Scotch-Irish to submit to the excise tax. The imposition by the National Government of the window tax led to the 'Hot-water Rebellion' among a part of the German population in 1798. Internal improvements were projected early, and the Schuylkill Canal was begun in 1815 and completed in 1825. From 1829 to 1836 the projected improvements called for the construction of 292 miles of canal and 126 miles of railroad, at a total cost of $35,000,000. The first bill for a public school system was passed in the face of violent opposition in 1834. Though both iron and coal had been known to exist before the Revolution, it was not until 1839 that anthracite was successfully applied to the manufacture of iron. The first oil well was sunk near Titusville in 1859.

At the outbreak of the Civil War five companies of Pennsylvania troops were the first to arrive in Washington under President Lincoln's call for troops on April 15, 1861, and twenty-five regiments were formed during the month. The draft was necessary before the end of the war, but troops were furnished. The State was three times invaded, twice at Chambersburg and once by General Lee's army, which fought the battle of Gettysburg (q.v.). Since the war the chief events of importance have been the rapid growth of the steel, oil, and coal industries and frequent labor troubles. In 1877 a great strike of railroad employees led to violence and the defeat of the militia at Pittsburg. The despatch of regular troops was necessary to quell the disorder. On May 31, 1889, a dam at the outlet of Conemaugh Lake broke and a great wall of water overwhelmed Johnstown (q.v.) and several smaller towns, drowning more than 2000 people and destroying property to the value of $10,000,000. The strike at the Carnegie Company's mills at Homestead, near Pittsburg, July 6, 1892, was one of the most serious ever known in America. Martial law was declared, and the entire militia force was called out. An extensive strike of coal-miners in Hazleton region in 1900 was followed by a general strike in the anthracite region in 1902.

In national elections the State was at the outset Federalist, but in 1796 fourteen of its fifteen votes were cast for Jefferson. Eight votes were cast for him again in 1800, while seven went to the Federalist candidate. From this time until 1840 the State was Democratic. In 1835 the Anti-Masonic party succeeded in electing the Governor and the agitation gave the State to the Whig electors in 1840. In 1838 a dispute between the Democrats and Whigs concerning the results of an election in one of the State Congressional districts caused much excitement, each party contending that it had elected not only the Congressman, but the members of the State Legislature in that district. The disturbance, which was later known as the 'Buck-Shot War,' was, however, short-lived, and the dispute was settled in favor of the Democrats. The State gave its vote to Polk in 1844, to Taylor in 1848, and in 1852 and 1856 to the Democratic candidates. Since 1860 the State has been overwhelmingly Republican in national affairs, though, on account of factional fights in the Republican ranks, a Democratic Governor has been twice elected.

Governors of Pennsylvania.

Under the Swedes	
Peter Minuit	1638-41
Peter Hollandaer	1641-43
John Printz	1643-53
John Pappegoya	1653-54
John Claudius Rysingh	1654-55
Under the Dutch	
Peter Stuyvesant, Director General of the New Netherland	1655-64
Derck Smidt, Schout Fiscal	1655
John Paul Jacquet, Vice-Director	1655-57
Colony of the City	
Jacob Alricks, Director	1657-59
Alexander d'Hinyossa	1659-63
Colony of the Company	
Goeran Van Dyck, Schout Fiscal	1657-58
William Beekman, Vice-Director	1658-63
Alexander d'Hinyossa, Director of united colony	1663-64
Under the English	
Richard Nicolls	1664-67
Francis Lovelace	1667-73
Recaptured by the Dutch 1673	
Anthony Calve, Governor-General	1673-74
Peter Alricks, Commander	1673-74
Under the English	
Sir Edmund Andros	1674-81
Proprietary Government	
William Markham, Deputy Governor	1681-82
William Penn, Proprietor	1682-84
The Council (Thomas Lloyd, President)	1684-88
The Five Commissioners	1688
Capt. John Blackwell	1688-90
The Council (Thomas Lloyd, President)	1690-91
Thomas Lloyd, Deputy Governor William Markham, Dep'y Governor Lower Counties	1691-93
Under the Crown	
Benjamin Fletcher, Gov. of New York, Governor William Markham, Lieutenant-Governor	1693-95
Proprietary Government	
William Markham, Lieutenant-Governor	1695-99
William Penn, Proprietor	1699-1701
Andrew Hamilton, Lieutenant-Governor	1701-03
The Council (Edward Shippen, President)	1703-04
John Evans, Lieutenant-Governor	1704-09
Charles Gookin, "	1709-17
Sir William Keith, "	1717-26
Patrick Gordon, "	1726-36
The Council (James Logan, President)	1736-38
George Thomas, Lieutenant-Governor	1738-47
The Council (Anthony Palmer, President)	1747-48
James Hamilton, Lieutenant-Governor	1748-54
Robert Hunter Morris, "	1754-56
William Denny, "	1756-59
James Hamilton, "	1759-63
John Penn, "	1763-71

The Counc. (James Hamilton, President)	1771
Richard Penn, Lieutenant-Governor	1771-73
John Penn, "	1773-76
Council of Safety (Thomas Wharton, President)	1776-77

PRESIDENTS OF THE SUPREME EXECUTIVE COUNCIL

Thomas Wharton, Jr	1777-78
George Bryan (acting)	1778
Joseph Reed	1778-81
William Moore	1781-82
John Dickinson	1782-85
Benjamin Franklin	1785-88
Thomas Mifflin	1788-90

GOVERNORS OF STATE

Thomas Mifflin	Federalist	1790-99
Thomas McKean	Democratic-Republican	1799-1808
Simon Snyder	"	1808-17
William Findlay	"	1817-20
Joseph Heister	Independent Democrat	1820-23
John Andrew Shulze	Democratic-Republican	1823-29
George Wolf	"	1829-35
Joseph Ritner	Anti-Masonic	1835-39
David Rittenhouse Porter	Democratic	1839-45
Francis Rawn Shunk	"	1845-48
William Freame Johnston	Whig	1848-52
William Bigler	Democratic	1852-55
James Pollock	"	1855-58
William Fisher Packer	"	1858-61
Andrew Gregg Curtin	Republican	1861-67
John W. Geary	"	1867-73
John F. Hartranft	"	1873-79
Henry M. Hoyt	"	1879-83
Robert E. Pattison	Democratic	1883-87
James A. Beaver	Republican	1887-91
Robert E. Pattison	Democratic	1891-95
Daniel H. Hastings	Republican	1895-99
William A. Stone	"	1899-1903
Samuel W. Pennypacker	"	1903—

BIBLIOGRAPHY. MacVeagh, *Pennsylvania* (Boston, 1889); Wickersham, *History of Education in Pennsylvania* (Lancaster, 1886); Fisher, *The Making of Pennsylvania* (Philadelphia, 1896); Roberts, *Anthracite Coal Industry* (New York, 1901); and for the history: *Pennsylvania Archives*, 1st series, 12 vols., 2d series, 19 vols., 3d series, 30 vols.; *Colonial Records*, 12 vols.; Proud, *History of Pennsylvania* (Philadelphia, 1797-98); Carpenter, id. (ib., 1869); Cornell, id. (New York, 1879); Hazard, *Annals of Pennsylvania, 1609-82* (Philadelphia, 1850); Egle, *History of Commonwealth of Pennsylvania* (Harrisburg, 1876); Diffendorffer, *The German Immigration into Pennsylvania* (Lancaster, 1900); Kuhns, *German and Swiss Settlements in Pennsylvania* (New York, 1901); Sharpless, *History of Quaker Government in Pennsylvania* (2 vols., Philadelphia, 1898-99); id., *Two Centuries of Pennsylvania History* (ib., 1900); Fiske, *Dutch and Quaker Colonies in America* (Boston, 1899); Bolles, *Pennsylvania Province and State* (Philadelphia, 1900); Shimmell, *History of Pennsylvania* (Harrisburg, 1900).

PENNSYLVANIA, HISTORICAL SOCIETY OF. An association organized in Philadelphia December 2, 1824, and incorporated June 2, 1826. Its object is the elucidation of history, with special reference to that of Pennsylvania. It has a valuable historical library and a museum at Philadelphia. The society has a subscribed publication fund of $40,000, the revenue from which is expended in printing matter of historic interest. This fund has published 14 volumes of *Memoirs of the Society*, and 26 volumes of *The Pennsylvania Magazine of History and Biography*, issued in quarterly numbers. The society has also published an historical map of the State, a volume of *Collections*, and one on *Pennsylvania and the Federal Constitution*.

PENNSYLVANIA, UNIVERSITY OF. An institution of higher learning in Philadelphia, Pa., established in 1740 as a charitable school, and raised to the grade of an academy in 1751 through the efforts of an association of citizens formed in consequence of a pamphlet published by Benjamin Franklin, entitled, "Proposals Relative to the Education of Youth in Pennsylvania." The academy, consisting of an English, a mathematical, and a Latin school, each under a master, with subordinate tutors and ushers, proved so successful that in 1753 it received a charter from the Proprietors, Thomas and Richard Penn. Two years later it had attained a standard which justified the granting of degree conferring powers, and in 1755 the institution was converted into the College and Academy of Philadelphia. During the agitated times of the wars with the French the provost, Rev. William Smith, opposed so vehemently the non-resistance policy of the Pennsylvania Legislature that he was arbitrarily thrown into prison, where he faithfully received his classes. He was subsequently sent to England to raise funds for an endowment, and there met the commissioner from King's (Columbia) College on a similar mission. Through the influence of the Archbishop of Canterbury they received a circular letter from the King, and succeeded in raising a considerable endowment for each college. On Doctor Smith's return a letter to the trustees from the Archbishop of Canterbury, Thomas and Richard Penn, and Rev. Samuel Chandler represented that the institution was originally founded and carried on for the benefit of a mixed body of people; that at the time of making the collection its officers included representatives of various Christian denominations; and, since jealousies had arisen between parties, it was recommended to the trustees to make a fundamental declaration to prevent inconveniences of this kind. Accordingly, in 1764, the trustees bound themselves and their successors to retain the original wide plan of the institution and "to use their utmost endeavors that the same be not narrowed, nor the members of the Church of England, or those dissenting from them (in any future election to the principal offices), be put on any worse footing in this seminary than they were at the time of receiving the royal brief." In 1779 this resolution was construed by the Legislature into a "narrowing of the foundation," and seized as a pretext for confiscating all the rights and properties of the college, which were bestowed upon a new organization, called in the charter the "Trustees of the University of the State of Pennsylvania." Ten years later these rights and properties were restored, and in 1791 an act was passed amalgamating the old college with the new university under its present title. In 1872 the university was removed to the present site.

The departments of the university are the college, including the School of Arts, the Towne Scientific School, and the courses for teachers; the Departments of Philosophy (Graduate School), Law, Medicine, Dentistry, Veterinary Medicine, and Archæology; the Wistar Institute of Anatomy and Biology; the Laboratory of Hygiene; the Veterinary Hospital; the Library, and the Flower Astronomical Observatory; Physical Education. The School of Arts offers courses in arts and science, finance and commerce, biology and music. The Towne Scientific School offers courses in architecture, science and technology, mechanical, electrical,

civil; and chemical engineering, and chemistry. Candidates are admitted on passing the examination set by the college, or by the Entrance Examination Board of the Middle States and Maryland, or on the diplomas of the public high schools. Free tuition is offered through the 2 Penn scholarships, filled by the Governor of the State, 50 Philadelphia free city scholarships, 5 competitive State scholarships, a General Alumni Society scholarship, and 31 scholarships not confined to special localities. The college courses in arts and sciences, finance and commerce, and biology are planned to enable the student to complete his work in three, four, or five years, at his option, the successful completion of 60 units of work being required for graduation. Students are not permitted to take less than 12 units a year, a unit being defined as one hour's work a week for one year in lectures or recitations, or two hours' work a week in laboratory practice. In the course in arts and sciences the prescribed studies amount to 22 units and group studies to 18 units, the remaining 20 units being made up of free electives. Provision is made for a senior composite year in which eight units are credited to the work of the first year class in medicine. In the Scientific School, the architectural course covers four years. The courses in science and technology cover five years. The Graduate Department offers eight scholarships on the Harrison Foundation, entitling the holder to free tuition and an income of $100, 30 university scholarships, providing only free tuition, and 29 fellowships, with incomes ranging from $200 to $800. The Graduate Department for women offers 5 fellowships.

Of the professional schools of the university, that of medicine is best known and has always been one of the strong departments. The Dental School especially has a wide reputation in Australia and in Spanish American countries. The Flower Astronomical Observatory is situated two miles beyond the city limits, and there is a small working observatory in the college grounds. The university buildings, 29 in number, stand on Woodland Avenue, on property covering over 56 acres in the city proper, and provide dormitory accommodations for about 500 students. They include a University Hospital, with a training school and home for nurses, and the Howard Houston Hall, a students' club.

The university confers the degrees of Bachelor of Arts, Laws, Music, and Science, Master of Arts and Science, Doctor of Philosophy, Medicine, Dental Surgery, and Veterinary Medicine, and the technical degrees of Civil, Mechanical, Electrical, and Chemical Engineer. In 1902 the faculty numbered 281, and the student body 2578, distributed as follows: School of Arts, 476; Scientific School, 431; Teachers' Courses, 206; Graduates, 192; Law, 339; Medicine, 475; Dentistry, 403; Veterinary Medicine, 62. The library contained 212,861 volumes. The university grounds and buildings were valued at about $4,500,000 and extensive plans were undertaken in the early part of 1903 for a group of new buildings to be erected outside the present limits of the university grounds. The first step toward this end was the announcement of a new building for the Wharton Scientific School, to cost $200,000, the gift of Joseph Wharton, the founder. The endowment of the university in 1902 was $9,000,000 and its income was $1,490,000. The heads of the university, since its beginning as a collegiate institution in 1755, have been: William Smith (1755-80); John Ewing (1780-1802); John McDowell (1807-10); John Andrews (1810-13); Frederick Beasley (1813-28); William Heathcote de Lancey (1828-33); John Ludlow (1834-53); Henry Vethake (1854-59); Daniel Raynes Goodwin (1860-68); Charles Janeway Stillé (1868-80); William Pepper (1881-94); Charles Custis Harrison (1894—).

PENNSYLVANIA, Western University of. An institution at Allegheny, Pa., the second oldest institution of learning west of the Appalachian Mountains, founded as the Pittsburg Academy in 1786, incorporated in 1787, and reincorporated under its present name in 1819. Since 1895 women have been admitted on the same terms as men. The university comprises collegiate, engineering, medical, and law departments, and colleges of pharmacy and dentistry. Several of the schools are institutions formerly independent. The Medical School became a part of the university in 1892, and the Law School in 1895. The Allegheny observatory was founded in 1859 by the Allegheny Astronomical Society, and in 1867 was transferred to the university. It has achieved an international reputation through the work of its successive directors, Professors Langley and Keeler, in the fields of solar physics and astronomical spectroscopy. New buildings for this department were erected in 1901. In 1902 the university had 892 students, 116 instructors, and a library of 20,000 volumes.

PENNSYLVANIA COLLEGE FOR WOMEN. An institution for the higher education of women in Pittsburg, Pa., founded in 1869, under the auspices of the Presbyterian Church. Besides the collegiate department it has a preparatory school and departments of music and art, with a total registration in 1902 of 185 and 20 instructors. In that year the income was $40,000 and the college property was valued at $250,000. The library contained 3000 volumes.

PENNSYLVANIA DUTCH, or **Pennsylvania German.** The language of the Germans who emigrated to Pennsylvania between 1683 (when Pastorius settled in Germantown) and the middle of the eighteenth century. During this time some 100,000 settled principally in the southeastern counties of the State, such as Lancaster, York, Franklin, Cumberland, Berks, Schuylkill, and Lehigh. The emigration was due partly to the ravages of the armies of Louis XIV., and partly to religious persecution. The settlers came principally from the Rhenish Palatinate, Württemberg, and Switzerland, with a sprinkling from the Lower Rhine, Bavaria, Alsace, and Saxony. As most of the dialects spoken by these people belonged to the Alemannic and Franconian groups (see German Language), the idiom of the Pennsylvania Dutch is really High German, and the confusion with Dutch is due to the fact that the settlers called their language 'Deitsch' (German). Although a variety of dialects were originally represented, that of the Rhenish Palatinate (Rhenio-Franconian) so predominated and influenced the others that the language may be regarded as fairly homogeneous. Owing to their segregation in religious communities, the emigrants clung tenaciously to their mother tongue, but were gradually compelled by force of circumstances to accept many English words, especially

the names of objects in daily use, until the dialect can best be described as a fusion of Franconian and Alemannic with an admixture of English varying from one per cent. in the rural districts to a large percentage in the towns.

The language exhibits the characteristic dialectic darkening of *a* to *o* (*schlof* for *Schlaf*; *jor* for *Jahr*), further the fronting of *ö* to *e* (*here* for *hören*; *bes* for *böse*) and of *ü* to *i* (*bicher* for *Bücher*). German *ei* and *äu* generally appear as *ē* (*del* for *Teil*; *bom* for *Bäume*). The consonants *p*, *pp*, and *d* are not shifted (*pund* for *Pfund*; *kloppe* for *klopfen*; *kopp* for *Kopf*; *dag* for *Tag*; *mudder* for *Mutter*). Final vowels and inflectional *n* are dropped (*mid* for *müde*; *bom* for *Bäume*; *finne* for *finden*; *gfunne* for *gefunden*).

The writings of the Pennsylvania Germans have been mainly of a religious character, such as hymns and polemical pamphlets. They were written as a rule in the High German literary dialect, with, however, a number of exceptions. Within the last forty years, however, a number of poems in the dialect have been written. Consult: Seidensticker, *Bilder aus der deutsch-pennsylvanischen Geschichte* (2d ed., New York, 1886); id., *The First Century of German Printing in America* (Philadelphia, 1893); Cobb, *Story of the Palatines, an Episode in Colonial History* (New York, 1897); Sachse, *The German Sectarians of Provincial Pennsylvania, 1694-1800* (ib., 1895-1900); Haldeman, *Pennsylvania Dutch* (ib., 1872); Learned, *The Pennsylvania German Dialect* (Baltimore, 1889).

PENNSYLVANIA-GERMAN SOCIETY, The. An association organized in Lancaster, Pa., April 15, 1891, to collect, preserve, and publish documents relating to the history of the Pennsylvania Germans, and cause original papers to be prepared and read before the society. Its regular members, who now number about 400, must be direct descendants of the early German or Swiss emigrants to the colony of Pennsylvania. The society holds an annual meeting in some one of the smaller cities of eastern Pennsylvania, and publishes annually a volume of *Proceedings*, including the papers read at each meeting.

PENNSYLVANIA STATE COLLEGE. A coeducational institution of higher learning at State College, Pa., organized on a collegiate basis as the Farmers' High School in 1859. In 1862 the name was changed to The Agricultural College of Pennsylvania, and in 1874 to its present title. The principal income of the college is derived from the sale of public lands held in trust by the State. The grounds contain 400 acres, of which the campus covers 60 acres, the remainder being devoted to a model farm. The courses of instruction occupy four years. The general courses offered are a classical general science, a Latin scientific, and a philosophical course. The technical courses include agriculture, biology, chemistry, civil, electrical, mechanical, and mining engineering, mathematics, and physics. All courses, except the classical, lead to the B.S. degrees. In the graduate courses the degrees of C.E., M.E., E.M., E.E., and M.S. are conferred. In 1902 the faculty numbered 48; the college was attended by 602 students, of whom 420 were in the School of Engineering; 1800 persons took correspondence courses in agriculture. The endowment was $517,000, the income was $137,992, and the value of the college grounds, buildings, and equipment was $850,000. The library contained 19,181 volumes.

PENNY (AS. *penig*, *pennig*, *peneg*, *pening*, *pæning*, *pending*, OHG. *phantinc*, *pfentinc*, *pfending*, *phenning*, Ger. *Pfenning*, *Pfennig*, penny; perhaps connected with OHG. *phant*, *pfant*, Ger. *Pfand*, pawn, pledge, or less plausibly with OHG. *pfanna*, *phanna*, *panna*, Ger. *Pfanne*, AS. *panne*, Eng. *pan*, from ML. *panna*, from Lat. *patina*, shallow bowl). A British coin and money of account. After the sceattæ (q.v.) it is the most ancient of the English coins, and was the only one generally current among the Anglo-Saxons. The penny is first mentioned in the laws of Ina, King of the West Saxons, about the close of the seventh century. It was at that time a silver coin, and weighed about 22½ troy grains, being thus about $\frac{1}{240}$ of the Saxon pound weight. This relation to the pound weight is evidently derived from the usage of the early Franks, who retained the Roman division of the *libra* into 20 *solidi*, and the *solidus* into 12 *denarii* (the denarius being thus the 240th part of the libra or pound). (See MARK.) Half-pence and farthings were not coined in England till the time of Edward I., but the practice previously prevailed of so deeply indenting the penny with a cross mark that the coin could be easily broken into two or four parts as required. Silver farthings ceased to be coined under Edward VI., and silver half-pennies under the Commonwealth. By this time the penny had steadily decreased in weight; it was 18 grains under Edward III., 15 and 12 under Edward IV., 8 under Edward VI., and under Elizabeth it was finally fixed at $7\frac{23}{31}$ grains, or $\frac{1}{62}$ of an ounce of silver, a value to which the subsequent copper pennies, which till 1860 were the circulating medium, closely approximated. In 1672 an authorized copper coinage was established, and half-pence and farthings were struck in copper. The penny was not introduced till 1797, and at the same period the coinage of twopenny pieces was begun; but these latter, being found unsuitable, were withdrawn. The penny of the present bronze coinage is of only about half the value of the old copper penny. The German *pfennig* was also originally a silver coin, bearing the same relation to the German pound of silver as the English penny to its pound. And in the twelfth century it was made so broad, in imitation of the Byzantine coins, that it would no longer bear to be struck with a die on each side as before, but was struck on one side only. In the beginning of the fourteenth century the mark of silver was anew divided into 60 parts or coins, which, to distinguish them from the old coins, were called *grossi denarii*, whence the term *groschen*. In the modern monetary system of Germany, the pfennig is a nickel coin, the hundredth of the mark, the latter being equal to a shilling or about $0.25.

PENN YAN. A village and the county-seat of Yates County, N. Y., 45 miles north by west of Elmira; on Lake Keuka, and on the Northern Central and the New York Central railroads (Map: New York, C 3). It has an attractive location on the lake, the shores being covered with cottages and the hills with vineyards. There are Penn Yan Academy, a public school library, and a fine county court house and jail. The village is situated in a noted grape-growing region, and has extensive agricultural, fruit, and wine-making

interests, as well as manufactures of flour, hubs and spokes, grape baskets, malt, and paper. The manufacturing industries are promoted by excellent water power derived from the lake. Penn Yan is governed by a village president and board of trustees. The water-works are owned and operated by the village. Penn Yan was settled about 1800 and was incorporated as a village in 1833. The early settlers were partly Pennsylvanians and partly New Englanders (Yankees); hence the name. Population, in 1890, 4254; in 1900, 4650.

PEN'NYPACK'ER, GALUSHA (1844—). An American soldier, born in Chester County, Pa. He received an academic education, and on April 22, 1861, enlisted for three months in the Federal service as a quartermaster-sergeant in the Ninth Pennsylvania Infantry. On August 22d he reentered the service as a captain in the 97th Pennsylvania; served throughout the war, and on February 18, 1865, was commissioned a brigadier-general of volunteers. Until April, 1864, he was principally engaged in the operations along the Atlantic coast. He was then transferred to the Army of the James, and participated in the action at Drury's Bluff (May 13-16, 1864), where he was wounded, and led a brigade at the capture of Fort Harrison, where he was again wounded. He recovered in time to participate in the final assault on Fort Fisher (January 15, 1865), but was again wounded, this time so severely that he was confined to the hospital until April, 1866, when he resigned from the service. During this time he received his commission as brigadier-general of volunteers and the Congressional medal for bravery in battle. The following July he was appointed colonel of the 34th regular infantry, and on March 2, 1867, was brevetted major-general U. S. A. In 1869 he was transferred to the 16th Infantry, which he commanded until his retirement, in 1883.

PENNYROYAL (variant, influenced by popular etymology with *penny*, of obsolete *puliol-royal*, ME. *puliall real*, from ML. *pullium regale*, Lat. *pulcium regale*, royal fleabane, from *pulcium*, fleabane, from *pulex*, flea, and *regale*, royal, from *rex*, king). A species of mint (q.v.). In North America a small plant (*Hedeoma pulegioides*), also bears this name, and having, like the mints, a pleasant aromatic smell and a warm pungent taste, it is used as an infusion in domestic medicine to promote perspiration. The plant is common from New England to the Dakotas and southward. The name is also sometimes applied to *Mentha Canadensis*, which resembles the English pennyroyal (*Mentha Pulegium*).

PENOB'SCOT. A former leading tribe of the Abnaki confederacy (of the Algonquian stock). They claimed the entire basin of the Penobscot River, Maine, and had their principal village, of the same name, about the present Veazie or Bangor. A French mission was established there in 1688. When first known to the whites the Penobscot, under their chief, Bashaba, seem to have had dominion over all the New England tribes southward to or beyond the Merrimac River. They took active part on the French side in all the colonial wars on the New England frontier up to 1749, when they made a treaty of peace with the English and have remained quiet ever since. This treaty brought them into disfavor with the Abnaki and other refugees at Saint Francis, who continued hostilities in the French interest, for which reason very few of the Penobscot ever joined their emigrant brethren in Canada, but remained in their old homes. For their services on the American side in the Revolution they were confirmed in possession of a small reservation on the Penobscot above Bangor, where they still reside, their principal settlement being Oldtown, upon an island in the river. They number now about 400, still preserving their language and subsisting by hunting, fishing, lumbering, and basket-making.

PENOBSCOT BAY. An inlet of the Atlantic Ocean indenting the coast of Maine (Map: Maine, F 7). It is 28 miles wide at the mouth and penetrates an equal distance inland, narrowing gradually to its head, where it receives the Penobscot River. It contains several large and a number of small islands, and on its shores are numerous coves with deep water.

PENOBSCOT RIVER. The principal river of Maine. It rises on the northwestern boundary of the State, and flows east to Lake Chesuncook, then southeast through Pamedumcook Lake at the foot of Mount Katahdin, and finally southward until it empties into the Atlantic Ocean through Penobscot Bay (Map: Maine, F 5). It is nearly 300 miles long, and is navigable for large vessels to Bangor, 55 miles from its mouth. Above Bangor there are falls supplying power to sawmills, and the upper course of the river is used for floating large numbers of logs from the forests of northern Maine.

PENOLOGY (from Lat. *pœna*, punishment + Gk. λογία, *-logia*, account, from λέγειν, *legein*, to say). A term defined by Dr. F. H. Wines, one of the foremost penologists of the United States, as the treatment of crime for its repression and prevention, and of criminals for their extirpation or rehabilitation. The oldest form of the forcible repression of crime and treatment of criminals is execution. The death penalty naturally suggested itself to primitive peoples as the simplest, surest means of ridding society of its dangerous members. With the advance of civilization, however, the number of offenses for which the death penalty is inflicted has steadily decreased. (See CAPITAL PUNISHMENT.) A later important form of forcible repression is that of transportation, or the establishment of penal colonies, to which criminals are removed. England, Russia, and France have employed this system with more than doubtful success. England, indeed, has abandoned it. (See TRANSPORTATIONS PENAL.) A third and later form is the prison. The idea of punishment by imprisonment does not seem to have entered the mind of the rulers of antiquity, although the prison was as a matter of fact, from its crowded and filthy condition, its want of ventilation, the foul fevers and plagues engendered there, and the starvation inflicted upon its hapless inmates, a place of torture and speedy death. It was primarily a place for the sequestration of persons obnoxious to the despotic ruler, as well as of debtors, and for the detention of persons charged with other crimes, until they were tried. It is only in comparatively recent times that the prison itself has come to be regarded as a place of punishment, a place for the confinement of condemned persons; and the name 'jail' is now generally employed to designate the place where persons under accusation are com-

pelled to abide pending the determination of their guilt or innocence. Of all the institutions of this kind in the United States the county jails are the most unsatisfactory: they are generally breeding places of crime and licentiousness, because prisoners of all grades, of all ages, and sometimes even of both sexes, are herded together.

The idea of reformation has for a century played an increasingly important part in our modern prison systems. In 1773 John Howard, an English country gentleman, having been appointed high sheriff of Bedford, found so many abuses in the jails of his county that he was moved to call the attention of all England to its prisons everywhere. Up to this time the management of jails in England was under no public supervision whatever. It was the custom of the jailer, who was not even paid by the community for the performance of his duties, to collect his fees from the prisoners in his custody. Howard's life was henceforward spent in attempts to improve the conditions of the prisoner, but his reforms were mainly those which looked to the humane treatment rather than to the reformation of the criminal.

The problem of the restoration of the criminal to society is a later work of the penologist. As to the method of its solution penologists do not all agree. Two distinct systems of prison discipline, which are commonly known as the Pennsylvania, or Philadelphia, and Auburn systems, have grown up in the United States. The first, or 'separate system,' insists upon the separation of prisoners by day and by night; the second, by night only. From these two a third has been evolved, which is in a certain sense a combination of the two, but has also distinct features of its own. It is known as the Irish system, because it has been most fully and successfully applied in Ireland, under Sir Walter Crofton.

The essential principle of the separate system is the complete physical separation of prisoners. It rests upon the conviction that mutual contact between them is necessarily corrupting, and that classification upon any basis except that of individual character is impossible. At first, solitary confinement, without labor or recreation or mental contact with any human being, even with the officers of the prison, except in case of necessity, was the form which this experiment assumed. But the severity of this rule has been relaxed on account of the injury which it wrought in some cases both to the body and the mind of the subject. Now the prisoner is not excluded from a degree of companionship with the prison officials and authorized visitors. The convict, however, sleeps, eats, and works in his cell alone, and takes his exercise in an adjoining space outside. It is claimed for this system that it removes a man from evil associates; trains him as an individual, and increases the personal influence of the authorities and teachers; that it gives greater opportunity for reflection; that the convict who reforms under it cannot afterwards be identified by professional criminals and so led back to evil ways; and that discipline may be varied according to the needs of individual convicts. The objections to this system are: that it necessitates a large ground area and costly buildings; that it unfits a man for ordinary methods of work, because he has worked alone, and under exceptional conditions, such as do not prevail in the outside world where men coöperate; that loneliness is injurious to morals and to mental and physical health. It is claimed, however, that this system has produced excellent results; its friends maintain that, more than any other system, it reduces the number of recidivists, that is, of discharged convicts who lapse again into crime. The International Prison Congress of 1900 reached the conclusion that this method must be regarded with favor as having checked criminality.

The prison at Auburn, in the State of New York, represents the 'congregate' or 'silent' system, which now prevails throughout the United States. Prisoners sleep in separate cells, but are brought together during the day in large workshops; separation between them, the necessity for which was acknowledged, is secured by a rule forbidding them to communicate with one another or with visitors. The difficulty of enforcing this rule has led to its relaxation. The Eastern Penitentiary in Philadelphia was intended to be a strictly cellular prison for convicts of the higher grades in the United States, but it has long since ceased to be such, because of its seriously overcrowded condition. Among the causes which have contributed to the general adoption of the Auburn system are: The comparative cheapness of construction and maintenance of congregated prisons; the ease with which profitable labor may be introduced into them, especially in connection with machinery of all sorts; the facilities which they afford for contracting out the labor of convicts, thus relieving the administration of financial responsibilty.

The Irish system was, in its origin, an outgrowth of the experience of Captain Maconochie as governor of the penal settlement of Norfolk Island. Maconochie devised the 'mark system,' which is added to the 'ticket of leave' system, or conditional liberation (also an Australian invention), and the 'progressive' classification and the 'intermediate' prison, to constitute the four elements of the Crofton system. Briefly described, this system consists of four stages, of which the first is not less than eight months of strictly cellular confinement in the Mountjoy Prison, Dublin, with short rations and no employment but picking oakum for the first half of the time. The second is an indefinite period, not less than one year, of associated imprisonment, at Spike Island, where the prisoners are divided into four classes, and are promoted from one to the other according to their demeanor, labor, and study—an account being kept with them by the use of marks, and their promotion depending upon their record. The third is a short period of probationary detention in a condition intermediate between imprisonment and freedom, at Lusk, where the men are trained for entire freedom, and their capacity for it is tested prior to their liberation; the fourth is conditional liberation with police supervision. This system is supplemented by a scheme for obtaining employment for liberated prisoners.

The first American institution managed along these lines is the Elmira Reformatory (q.v.) opened in 1876 in the State of New York, and known as the New York State Reformatory. Prisoners received here are such as are convicted of their first offense for felony, and are held under what is known as the indefinite or indeterminate sentence; that is, they are not sentenced for a specific period of time, but may be held for the maximum period for which they might have been sentenced for the crime committed, and cannot be

discharged until they have served the minimum period provided by statute for such offense. Having served such minimum period, they may be allowed by the Board of Managers to leave the prison on parole, but must remain while on parole under the control of the Board and subject to be taken back to the institution.

Concerning the 'indeterminate sentence,' it should be noted that eminent penologists have favored this device on the ground that it is impossible for courts of justice to know just how long a period of incarceration is necessary to produce the desired effect upon an offender. Of two criminals sentenced to 10 years' imprisonment, one may be at the expiration of this period entirely unfit to be released, while another may have become ready and willing to assume the duties and responsibilities of citizenship. The fixed sentence, they claim, is as absurd as it would be for a physician to prescribe medicine for a period of ten days, and then omit to inquire what effect this treatment has produced in the patient at the expiration thereof. With an indeterminate sentence the prisoner is virtually his own custodian. When he understands this, his reformation—assuming him to be a reformable person and not a criminal by instinct—is rendered far more probable. The hope of freedom is the one stimulus to which he may be depended upon to respond. When the criminal in convinced that this hope is to be realized, not through some vague chance of pardon or escape, but whenever by his conduct in prison he makes it apparent to those in charge that society has nothing to fear from him, the work of his reformers is comparatively easy. Most penologists, therefore, see in this almost certain means of securing the coöperation of the criminal—a principle of reform of the greatest importance.

By means of the indeterminate sentence, a prisoner may be liberated conditionally, on parole. It is this actual experience with the out-side world which establishes a man's powers and intentions. Within the prison walls he cannot steal or murder or forge signatures, or otherwise menace the life or property of his fellow-man.

The indeterminate sentence has been tried in more than a quarter of the American commonwealths since 1876, but it has met with much opposition from the courts, judges very generally regarding it as an infringement of their prerogative of sentence, and finding constitutional objections to it unless the statute creating it is drawn with extreme care to fix a definite period for the expiration of sentence, and in some cases unless the release on parole is specifically described as a commutation for good behavior.

Bibliography. Wines, *Reformation and Punishment* (New York, 1895); Henderson, *Dependent, Defective, and Delinquent Classes* (Boston, 1901); Tallack, *Penological and Preventive Principles* (London, 1889); Drähms, *The Criminal* (New York, 1900). See Criminology; Juvenile Offenders; Prisons; Punishment; Reformatories; Recidivists.

PEN'RITH. A market town in Cumberland, England, in a picturesque and fertile valley, with rich and striking scenery in the vicinity, 17 miles southeast of Carlisle (Map: England, D 2). It has ruins of a fine old castle and in the parish churchyard is a monument of great antiquity known as the 'Giant's Grave,' formed of two pyramidal stones about 12 feet high. The town contains an ancient free grammar school. There are tanneries, saw-mills, and breweries; the trade is chiefly agricultural. Population, in 1901, 9180.

PEN'ROSE, Boies (1860—). An American political leader, born in Philadelphia. He graduated at Harvard in 1881, was admitted to the bar in 1883, and the next year was elected to the Pennsylvania State Legislature. From 1887 to 1895 he was a member of the State Senate, and from 1897 until 1903 a member of the United States Senate. He wrote a *History of the City Government of Philadelphia* (1887) and contributed to the *American and English Encyclopædia of Law*.

PENROSE, Francis Cranmer (1817-1903). An English architect, born at Bracebridge, near Lincoln. He studied under the architect Edward Blore and graduated at Magdalene College, for which he was traveling bachelor from 1842 until 1845. His *Principles of Athenian Architecture* (1851), a valuable work, was published by the Society of Dilettanti. In 1852 he became surveyor of the fabric of Saint Paul's Cathedral, which position he occupied until 1897. He was awarded the royal gold medal of the Institute of British Architects in 1883, and was president of that body in 1894 and 1895. In 1886 he was made director of the British Archæological School at Athens. Other works by him include *Graphical Method of Predicting Occultations of Stars and Solar Eclipses* (1869) and "Orientation of Greek Temples," in the *Transactions of the Royal Society* (1893-97).

PEN'RY, John (1559-93). A Puritan writer. He was born in Wales, and graduated B.A. at Cambridge, 1584; M.A. Oxford, 1586. Although always a layman, he was deeply interested in controversial theology on the Puritan side. It is, however, as the moving spirit of the little company of writers and printers who brought out the Martin Marprelate tracts (q.v.) that he is remembered. The excitement caused by these bitter attacks upon the alleged evils of the Church of England made it necessary for Penry to seek refuge in Scotland (1590-92). He was well received by the Presbyterian ministers and preached there. In September, 1592, he ventured to return to England, and settled in London. The following year he was arrested, brought to trial, and found guilty of treason. He was hanged on May 29, 1593. Consult his *Life* by Waddington (London, 1854).

PENRYN, pĕn-rĭn'. A municipal borough and market town in Cornwall, England, in a richly productive valley bordering on Falmouth Harbor, two miles northwest of Falmouth (Map: England, A 6). The famous Penryn granite is obtained here; 20,000 tons have been exported in the year. The rental of corporate property covers all principal expenses, and the town levies no local rates. Its incorporation dates from 1216. Population, in 1901, 3200.

PEN'SACO'LA. The second city of Florida, a port of entry, and the county seat of Escambia County, 204 miles west of Tallahassee; on the Louisville and Nashville and the Pensacola, Alabama and Tennessee railroads (Map: Florida, A 1). Situated on Pensacola Bay about six miles from the Gulf of Mexico, it has a land-

located, deep, and commodious harbor, the entrance to which is defended by forts Pickens, Barrancas, and McRee. There is a large navy yard here; and the remains of the Spanish fortresses San Miguel and San Bernardo are of interest. Among the fine structures in the city are the State Armory, opera house, court house, and the Federal Government building, the last having cost $250,000. There are public parks of considerable beauty. Pensacola is chiefly a commercial centre, its lumber interests being notable. It has a trade also in fish, coal, cotton, naval stores, grain, etc. The commerce of the port in 1901 included exports valued at $13,456,000 and imports to the amount of $238,000. Because of the increased trade, especially with the West Indies, extensive improvements are being made in connection with the railroad terminal facilities. Population, in 1890, 11,750; in 1900, 17,747.

Pensacola was permanently settled in 1696 by Spaniards from Vera Cruz. It was captured by the French in 1719, was restored to Spain in 1723, and passed into the hands of the British in 1763. In 1781 it was captured by a Spanish force under Governor Bernardo Galvez. During the War of 1812, owing to the assistance given here to the English, it was taken (1814) by General Jackson, who again in 1818 captured it on account of Spanish encouragement of hostile Indian attacks. The United States took formal possession in 1821, in pursuance of the treaty of 1819. In 1861 the Confederates seized the navy yard here, but were unable to capture Fort Pickens, and in 1862 they evacuated the city. A destructive fire occurred in 1864.

PENSACOLA BAY. An inlet of the Gulf of Mexico on the coast of Florida near the western boundary of the State (Map: Florida, A 1). Across its entrance lies the long, narrow island of Santa Rosa, leaving a passage only a mile wide, but deep and navigable. The inner bay is from 4 to 12 miles wide, and divides into two large branches, which penetrate about 25 miles inland. The entrance is fortified, and on the west shore lies the city of Pensacola (q.v.).

PEN'SERO'SO, IL (It., the pensive). A poem by Milton, written probably in 1632 at Horton. It is the complement of *L'Allegro* (q.v.) and is the unrivaled description of the impressions made by scenes of nature, art, and music on the mind of a thoughtful cultivated man.

PENSILE NESTS (from Lat. *pensilis*, hanging, from *pendere*, to hang). Nests of birds woven in the form of a bag, cup, or hammock, and suspended by the rim from the twigs of a tree, bush, or other plant. Many birds construct such nests, which are not only safer than in most other situations, but usually most skillfully and beautifully made. Prominent American examples are the nests of the Baltimore and orchard orioles, of the vireos, and of certain warblers. In South America, the caciques and some hummingbirds; in Europe, the titmice; and in Asia, the tailor-birds and weaver-birds, afford other examples in a great variety of forms and materials. See articles under the names of these birds; and Plates under NIDIFICATION and WEAVER-BIRD.

PENSION (Lat. *pensio*, payment, weight, from *pendere*, to weigh out). A pension is an annual income granted by public authority, usually for an antecedent public service, military or civil. In earlier days the granting of pensions was a royal prerogative which was frequently abused. At the present time in England civil list pensions are granted by the free grace of the sovereign and are frequently bestowed upon men of letters. Hereditary pensions granted in former times to national heroes and their descendants have been almost entirely commuted. Pensions are bestowed upon officers of the army and navy and to judges, as in the United States. Like most of the countries of Europe, England has a system of pensions for civil servants. A similar system is widely advocated for the United States. The theory of such pensions is generally that the assured provision for old age is a compensation for the low rates of pay which attach to the Government service. In some of the European countries a system of pensioning workingmen is now in force. (See OLD AGE PENSIONS.) In the ordinary service of the United States retiring pensions are confined to the Federal judges and the officers of the army and navy. The former at the age of seventy, after ten years of judicial service, may retire on full pay. The maximum pay on the retired list for officers of the army and navy is 75 per cent. of the active pay of their respective ranks. Congress has also by special act granted pensions to some of the widows of the Presidents.

MILITARY PENSIONS IN THE UNITED STATES. The system of military pensions in the United States had its germ in the colonial epoch. The necessity of calling upon the inhabitants for armed defense against the Indians and other foes seemed to impose the necessity of providing at public expense for those who were disabled, and for the families of those who perished in the struggles. In the Revolutionary struggle the troops were promised similar pensions, and officers who should remain in the service till the end of the war were promised half pay for life. The Continental Congress was unable to fulfill this obligation. After the adoption of the Constitution Congress took up the matter of pensions, and passed in 1792 a general pension law. Successive laws were passed improving the machinery for granting pensions, and enlarging the number of claimants, but no increase of rate was granted until 1816, when the rate of a full pension was raised from $5 per month to $8. The application of the law was at the same time extended to those who had fought in the War of 1812.

The principle of service pensions was introduced by the act of March 13, 1818. All survivors of the Revolutionary army or navy who had served until the close of the war, or at any period of the struggle for at least nine months, were entitled, if in needy circumstances, to pensions for life. For privates the rate was fixed at $8 per month. The law was loosely worded and the door left wide open to fraud. The grants of pensions became a public scandal, and a law of 1820 required all pensioners and applicants to file a statement of property in proof of their alleged indigence. Many were stricken from the rolls. Up to September, 1822, as many as 18,880 claims had been admitted, but at that time the number of pensioners was only 12,331, owing to the effect of the law of 1820. In 1832 a law was passed which granted full pay for life to all who had served at least two years in the Revolutionary War, and proportional payments to those

who had served less than two years but more than six months.

In 1836 began a long series of acts in favor of the widows of Revolutionary soldiers, restricted at first to those who had married before the close of the Revolution, but gradually growing more liberal until pensions were granted to all, irrespective of the date of marriage.

A similar development of legislation occurred with respect to pensions growing out of the War of 1812, and of the Mexican War. A part of this legislation is of recent date and was affected by the more liberal views as to pension legislation which followed the Civil War.

The first law pensioning soldiers of the Civil War was a disability pension law of July 14, 1862. It provided for the disabled survivor, and for the widows, orphan children, and dependent mothers of those who died by reason of any wound received or disease contracted while in the service of the United States and in the line of duty. Rates for total disability ranged from $8 to $30 a month, according to rank, and these were the rates accorded to widows. Successive laws beginning July 4, 1864, have increased the rates, adopting fixed rates for various kinds of disability.

A powerful stimulus was given to pensions expenditure by the passage of the Arrears Act in 1879. This provided that all pensions which had been granted or might hereafter be granted should date from the time of disability, provided application were made prior to the first of July, 1880. The operation of the law is shown by the fact that in 1881 the average of first payments to army invalids was $953.62, and $1,021.51 to army widows.

A bill to establish service pensions for persons in dependent circumstances was vetoed in 1886 by President Cleveland. A similar bill was passed June 27, 1890, providing that all persons who had served ninety days in the war and who were suffering from any mental or physical disability of a permanent character which incapacitated them from performing manual labor may receive pensions of from $6 to $12 a month, proportioned to the degree of inability to earn a support. Widows of soldiers who served ninety days who are dependent upon their daily labor for support may receive $8 per month.

In addition to the pensions granted under general laws, many claims, often rejected by the Pension Bureau, have been granted by special legislation. From 1861 to 1902 no less than 9296 acts have been passed granting such pensions. A large part of the activity of Congress is devoted to such measures, though a legislative body is ill-adapted to the proper investigation of claims. Elaborate rules which have been framed by the committees of the two Houses for their guidance offer, however, a certain guaranty for the justice and reasonableness of their procedure.

The provisions of the general pension law were of course applicable to the war with Spain, and this brief struggle has already brought forth a considerable number of pensions. Up to 1902 50,071 applications had been filed. There were on the roll July 1, 1902, 6611 Spanish War invalids and 2854 Spanish War widows.

The development of the pension system in the United States can be seen from a few typical figures taken from the Reports of the Commissioner of Pensions:

	Number of pensioners	Paid for pensions
1866	126,722	$15,450,550
1870	198,686	29,351,489
1875	234,821	29,270,407
1880	250,802	56,689,229
1885	345,125	65,171,937
1890	537,944	106,094,250
1892	876,068	139,394,147
1895	970,524	139,807,789
1900	993,529	138,462,431
1901	997,735	138,531,484
1902	999,446	137,504,268

This table indicates the considerable increase of pension expenditure between 1875 and 1880, due to the Arrears Act. This is brought out more fully by separating the first pension payments from the others, as is done in the following statement:

PENSION PAYMENTS

	First payments	Payments exclusive of the first
1878	$2,992,352	$23,598,439
1880	12,468,191	44,558,803
1883	29,906,754	29,915,481
1889	21,442,949	66,832,764
1890	38,721,866	66,806,314
1892	45,114,168	94,045,188
1896	11,289,278	126,925,484
1902	8,677,548	128,826,720

This statement shows the great increase in first payments immediately following the passage of the Arrears Act and its subsidence until 1890, when the great number of new pensioners increased such payments to a large extent. Our first table showed the rapid increase of the pension roll after 1890. At present we have in fact two systems of pensions—one under the general law, and the other under the law of 1890. Under the first there were 372,268 pensioners on the rolls in 1902 on account of service in the Civil War, and under the second 597,319 pensioners.

The Commissioner of Pensions gives in his report for 1902 the following statement of the aggregate cost of pension expenditures since July 1, 1790:

Revolutionary War (estimated)	$70,000,000 00
War of 1812 (service)*	45,025,297 09
Indian wars (service)*	5,814,206 53
Mexican War (service)*	31,861,377 57
War of the Rebellion	2,744,878,276 16
War with Spain	3,275,184 10
Total	$2,900,854,341 45

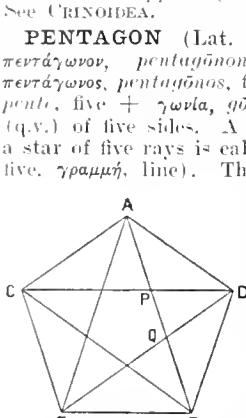
* Pensions on account of disabilities and deaths due to these wars are included under War of the Rebellion.

Consult: *Reports of the Commissioner of Pensions*, *Laws of the United States relating to army and navy pensions* (Washington, 1902), and Glasson, *History of Military Pension Legislation in the United States* (New York, 1900).

PENTAC'RINUS (Neo-Lat., from Gk. *πέντε*, *pente*, five + *κρίνον*, *krinon*, lily). A genus of stalked crinoids living in the deeper waters of the modern ocean and found fossil in rocks of Triassic to Pliocene age. The calyx is small, with slender arms that branch innumerable times to form a beautiful feathery head. The stem is long, pentangular in section, and provided with numerous prehensile cirri which constitute organs of attachment to various foreign objects. Pentacrinus was extremely abundant in the Jurassic

seas of Europe, and many slabs bearing numerous fine examples have been obtained from the Liassic rocks of Württemberg. The stems seem to have been of great length, one of them having been traced through many convolutions for about seventy feet. Though of such large size, the entire structure was extremely delicate. In some cases several individuals of various degrees of development and age have been found attached to pieces of fossil wood which must have been originally floating logs drifting about the surface of the ocean and supporting the sessile pentacrinids. See CRINOIDEA.

PENTAGON (Lat. *pentagonium*, from Gk. *πεντάγωνον*, *pentagōnon*, pentagon, neu. sg. of *πεντάγωνος*, *pentagōnos*, five-cornered, from *πέντε*, *pente*, five + *γωνία*, *gōnia*, angle). A polygon (q.v.) of five sides. A pentagon in the form of a star of five rays is called a *pentagram* (*πέντε*, five, *γραμμή*, line). This figure was used as a badge by the members of the Pythagorean school, and is said to have symbolized health. In the figure, if A, D, B, E, C, A are connected in order, a regular *convex* pentagon is formed and the sides of the pentagram become diagonals of the pentagon, and divide one another in golden section (q.v.). Whence in the pentagram Q divides AB, and P divides BA in golden section, and the figure may be constructed from this relation.



PENTAGRAM. See PENTAGON.

PENTAM'ERON (Neo-Lat., from Gk. *πέντε*, *pente*, five + *ἡμέρα*, *hēmera*, day), THE. One of the best of the *Imaginary Conversations*, by Walter Savage Landor (1837). The participants are Petrarch and Boccaccio, who discuss the great Italian writers of the fourteenth century. There is an appreciative setting of Tuscan scenery.

PENTAM'ERUS (Neo-Lat., from Gk. *πενταμερής*, *pentamerēs*, having five parts, from *πέντε*, *pente*, five + *μέρος*, *meros*, part). A group of hinged fossil brachiopods in which the shells are characterized by a more or less distinctly marked division of their interiors into five chambers by radiating septa that arise from the umbonal region. The type of the genus is *Pentamerus oblongus*, an oval to oblong smooth-surfaced shell that is very characteristic of the Upper Silurian rocks of North America and Europe. With this typical species have been associated a number of forms that are now recognized as more properly belonging in other genera. Such are: *Gypidula galeata*, a very characteristic species of the Lower Helderberg limestone; *Pentamerella arata*, a strongly plicate shell of the Lower Devonian; *Camerophoria*, an Upper Devonian to Permian genus which strongly resembles the rhynchonellids; and *Capellinia*, *Clorinda*, *Amphigenia*, *Conchidium*, *Stricklandinia*, all of which are important horizon-markers in the hands of the expert paleontologist.

PENTAM'ETER (Lat., from Gk. *πέντε*, *pente*, five + *μέτρον*, *metron*, measure). The name of a verse composed of five feet or measures. Its most frequent use is in iambic verse. The iambic pentameter is employed for the dialogue of Greek plays, and in English is used for two of the most popular forms, blank verse and the heroic couplet. In the Spenserian stanza, also, it supplies all verses except the last. The dactylic hexameter in Greek and Latin poetry alternates with the pentameter to make up the common form known as elegiac verse.

PENTATEUCH, pĕn'tă-tûk (from Lat. *Pentateuchus*, *Pentateuchum*, *Pentateuch*, from Gk. *πεντάτευχος*, *pentateuchos*, consisting of five books, from *πέντε*, *pente*, five + *τεῦχος*, *teuchos*, tool, book, from *τεύχειν*, *teuchein*, to prepare). The name given by the Greek translators to the group of five books which tradition ascribed to Moses: Genesis, Exodus, Leviticus, Numbers, and Deuteronomy. Among the Jews these five books are known as *Book of the Law*, or *The Five Parts of the Law*. The division into five books (to which the division of the Psalms into five sections presents a parallel) was made before the Septuagint translation, apparently for liturgical purposes, though the division into 54 sections (known as *parshioth* or *sidre*) represents the more specifically Jewish division adopted for the distribution of the Pentateuch over the Sabbaths of the year. The division into books or into sections is arbitrary, and has merely conventional significance, for the Pentateuch is a continuous work. In the opinion of modern scholars the Book of Joshua must also be added as an integral part, and it is customary at the present time to speak of the Hexateuch (sixfold book) rather than the Pentateuch. This term Hexateuch, however, must not be understood as implying that the six books are sharply separated from those which follow. The theory regards that part of the Old Testament which extends from Genesis to the end of Kings as a unified historical compilation, brought to its present shape in the Greek period, and aiming to give a complete history of the Hebrews from the creation of the world to the Babylonian captivity in B.C. 586. The Hexateuch covers the portion of this history to the conquest of Canaan and the distribution of the territory among the tribes; the Pentateuch ends with the death of Moses.

Scholars who hold this view reject the opinion, traditionally held till the beginning of the nineteenth century, that the Pentateuch is essentially a law book and the work of Moses. They regard it as a compilation at which many different individuals have worked throughout a long period of time; various sources have been used in making the compilation, among them certain legal codes, originally independent, which have been incorporated and constitute the legal portions. For a statement of what these sources are believed to be and a history of the discussion by which the theory has been developed and strengthened until it has come to be accepted by well nigh all scholars, see the article HEXATEUCH. In addition to what is there said the following points may be here noted.

The difference in style and point of view between the Prophetic narrative (JE) and the Priestly document (P) is very marked. Both begin with the creation of the world and cover the same ground, but the Priestly compiler passes more rapidly over the histories of the earlier and later patriarchs, emphasizing only such incidents as have a bearing on the religious theory underlying his narrative. His chief interest is

theological and ceremonial; his style stilted and formal. The Elohist and Yahwist, on the other hand are genuine story-tellers; events are told for their own sake, in a style flowing and attractive, which makes some of their narratives models of story-telling. In the Book of Exodus, likewise, historical incidents are rapidly passed over by the Priestly compiler till the revelation at Sinai is reached. Here, beginning with chapter xxv., his real object reveals itself—the formulation of the various ordinances, the construction of the tabernacle, its furniture, the organization of the priesthood, the distinction between Levites and priests, duties of both, ceremonies of consecration, sacrificial laws, festival regulations, and the like. The greater part of Leviticus and Numbers is taken up with sections of the Priestly Code introduced by the narrator at the point which he regarded as appropriate.

The chronological order of the codes (Book of the Covenant, Deuteronomic Code, Law of Holiness, Priestly Code) rests upon the detailed study of their contents and language. For example, in the Book of the Covenant there is no restriction of the Yahweh cult to a single sanctuary, which is the distinguishing mark of Deuteronomy and the other codes. A general demarcation between Deuteronomy and the two remaining codes is the lack of a distinction between Levites and priests in the former. The Code of Holiness recognizes the Aaronites only as priests; the Priestly Code is distinguished by a sharp division between Levites and priests. Besides these general indications there are many special ones which go to confirm the thesis.

The chief difficulties are introduced by the complicated and long continued editorial processes involved in the combination of the sources and the additions and modifications introduced in the course of time, which, while of minor importance, yet have a bearing on the problems involved. Thus the Book of Deuteronomy, which is more of an independent work than any other part of the Pentateuch, contains, besides the laws, a series of farewell discourses delivered by Moses and two poems—the so-called Song and Blessing of Moses (chaps. xxxii., xxxiii.). These must have been the work of writers who flourished subsequent to the promulgation of the codes. Such additions involve a long continued process which was not brought to a close till after the Exile, and which produced finally, not only the Hexateuch, but its continuation from the conquest of Canaan to the Exile. It is but natural that the details of this complicated editing should escape us and that some of the problems involved should be incapable of definite solution.

The combination of the codes, the historical narratives of the Hexateuch, and the additional sources used in the books from Judges to Kings, was effected under the influence of a theory which is already evident in the earlier compilers and becomes more fully and consistently adopted by the later schools of redactors. It was believed that the Hebrew clans had been selected as the chosen people of Yahweh, the one God of the universe, and a covenant made between the people and the deity at Mount Sinai. This covenant had been foreordained by a personal one between Yahweh (under other names, e.g. El Shaddai) and the patriarchs, Abraham, Isaac, and Jacob, and a promise for the future of the people had been given to Abraham and confirmed to the two other patriarchs. In close connection with the covenant at Mount Sinai a body of laws had been received directly from Yahweh and promulgated through Moses. As a direct consequence of these views the pious writers who put the Hexateuch into its final shape looked upon the entire history of Israel subsequent to the revelation at Mount Sinai as a constant falling away from the teachings given to the nation at the outset of its career. Even the progress from the crude religious notions of the early time to the lofty monotheism of the post-exilic prophets is represented as a retrogression, not an advance. The struggles, trials, and misfortunes of the nation are punishments sent by Yahweh for disobedience to his decrees. The leaders of the people, notably the kings, are viewed favorably or unfavorably according as they represent an approach to the supposed commands of Yahweh or a departure from them. The natural difficulties encountered in dispossessing the Canaanites, the equally natural rivalry and quarrels between the Hebrews and surrounding peoples (Moabites, Edomites, Philistines, Amalekites), even a distinct social advance, the establishment of a definite political organization in the shape of a kingdom, are all forms of punishment sent by Yahweh. These punishments culminated in the destruction of the two kingdoms in B.C. 722 and 586. The Exile, when Yahweh could no longer be appealed to in his legitimate sanctuary, was the grievous atonement for past sins.

For the literature, see the article HEXATEUCH.

PENTATHLON (Gk. *πένταθλον*, quintuple contest, from *πέντε*, *pente*, five + *ἆθλον*, *athlon*, contest). A combination of running, jumping, wrestling, throwing the discus, and casting the javelin, which formed one of the contests in Greek athletic games. The victory in the five events was settled by the wrestling, in which only the contestants victorious in the preceding events took part.

PENTAUR (Egyptian *Pen-ta-uere(t)*). An Egyptian scribe, who was formerly regarded as the author of the poem celebrating the valor of Rameses II. in the battle fought against the Hittites at Kadesh on the Orontes. In this character he is the hero of Ebers's novel *Uarda*. It is now known, however, that he was merely the copyist of the papyrus (Sallier 3) in which the poem has been preserved. According to the first Sallier papyrus he was still living in the tenth year of Meneptah. Another Pentaur, who seems to have been a member of the royal family of Egypt, is mentioned in the Turin judiciary papyrus as being concerned in the conspiracy against Rameses III. He was found guilty by the commission appointed to try the case and was forced to kill himself. Consult Wiedemann, *Geschichte von Alt-Aegypten* (Stuttgart, 1891).

PENTECOST. pēn'tē-kŏst (OF. *pentecoste*, Fr. *pentecôte*, from Lat. *pentecoste*, from Gk. *πεντηκοστή*, *pentēkostē*, fiftieth, sc. *ἡμέρα*, *hēmera*, day, from *πεντήκοντα*, *pentēkonta*, fifty). The Greek name of the second of the three chief festivals among the Hebrews, in the Old Testament commonly called the Feast of Weeks. It received the name Pentecost from the fact that its celebration was determined by an interval of seven weeks or fifty days from the Passover. (See WEEKS, FEAST OF.) From the Jewish Church it was introduced into the Christian, and with spe-

cial solemnity, as being the day of the descent of the Holy Ghost on the Apostles, and of the first solemn preaching of the Christian religion (Acts ii.). From early times Pentecost has been regarded as one of the great festivals of the Christian year, and it was chosen as one of the times for the solemn administration of baptism. The English name of the festival, Whitsunday, is derived from the white robes in which the newly baptized were clad. It is regarded as specially sacred to the Third Person of the Trinity, to whose honor the services of the day are directly addressed. As a trace of its originally agricultural character, the practice prevails in the East as well as in the West of decorating the churches with evergreens and flowers, as is done in England at Christmas, and it is interesting to note also that the whole time intervening between Easter and Pentecost is celebrated in the Roman Catholic Church with great solemnity. See PASSOVER.

PENTECOST, GEORGE FREDERICK (1842—). An American Presbyterian clergyman and author, born in Albion, Ill. He left Georgetown College to enter the Union Army, in which he served as chaplain (1862-64). He then entered the ministry, and between 1864 and 1887 was pastor of churches in Indiana and Kentucky, in Brooklyn and Boston. After evangelical work in Scotland, and a special mission to English-speaking Brahmins in India, Dr. Pentecost was for six years pastor of Marylebone Church, London, and (1897-1902) pastor of the First Presbyterian Church of Yonkers, N. Y. In 1902 he was appointed a special commissioner to China, Japan, and the Philippines to examine the missionary work of the Presbyterian and Congregational churches of America. He wrote: *A South Window* (1886); *Bible Studies* (1881-91); *Birth and Boyhood of Christ* (1896); *Systematic Beneficence* (1897); and *Christian Imperialism* (1902).

PEN'THESILE'A (Lat., from Gk. Πενθεσίλεια, *Penthesileia*). The daughter of Ares and Queen of the Amazons. In the latter part of the Trojan War she aided Priam, and showed great valor. Achilles slew her, and, in admiration of her deeds, desired to honor her with a tomb. The ridicule and offensive words of Thersites at this suggestion so provoked Achilles that he killed him, whereupon Diomedes threw the Amazon's body into the Scamander.

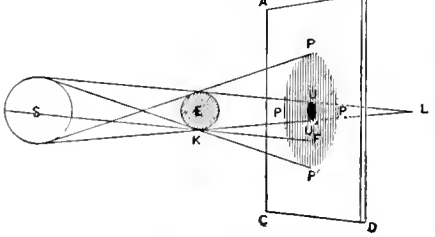
PEN'THEUS (Lat., from Gk. Πενθεύς). The son of Agave, daughter of Cadmus, and his successor on the throne of Thebes. He opposed the introduction of the Bacchic worship, and, being discovered watching the orgies of the Bacchanals, was torn in pieces by his mother and sisters on Mount Cithæron. The *Bacchæ* of Euripides is based on this legend.

PENT'LAND FIRTH. A channel connecting the Atlantic Ocean with the North Sea and separating the Orkney Islands from the mainland of Scotland (Map: Europe, C 3). It is 14 miles long, 6 to 8 miles wide, and crossed by a ferry-line. Its navigation is dangerous owing to strong currents, eddies, and rocks, but it is lighted by several lighthouses, and used by a large number of vessels.

PENTREMITES, pĕn'trĕ-mī'tēz (Neo-Lat. nom. pl., from Gk. πέντε, *pente*, five + Lat. *remus*, oar). A genus of fossil echinoderms typical of the class Blastoidea. The blastoids were crinoid-like animals that lived in abundance in the sea of late Paleozoic time. They resembled the crinoids in respect of the general plan of their organization, but they differed in that the calyx has only 13 principal plates arranged in very regular order, generally forming a bud-shaped head (whence the name), and in the absence of well-developed arms. In place of the arms there were very efficient pinnules that screened the food from the water. The calyx is usually small, pear-shaped, ovate, or globose in form and more or less pentangular in section. The stem is seldom found attached to the calyx. About 20 genera and 150 species of blastoids are known, by far the larger proportion of which are American only.

The blastoids appear to have been derived from some of the more regular cystideans of Ordovician time. The earliest member of the group is *Troostocrinus*, an elongate slender species from the Niagara group of Tennessee. *Elæaerinus* (*Nucleocrinus*) *verneuili* is a well-known index fossil of the Lower Devonian limestones of the Central States. The blastoids attained great prominence in the Subcarboniferous of North America, especially in the Saint Louis and Kaskaskia limestones of the Mississippi Valley. Here the most prominent genus is *Pentremites*, which seems to be unknown in Europe, where it is represented in the Devonian rocks by an ancestral form *Pentremitidea*. See Von Zittel and Eastman, *Textbook of Palæontology*, vol. i. (New York and London, 1900); and Etheridge and Carpenter, *Catalogue of the Blastoidea in the Geological Department of the British Museum*. The latter work contains a full bibliography to the literature of the group. See CRINOIDEA; ECHINODERMATA.

PENUM'BRA (Neo-Lat., from Lat. *pene*, *pæne*, almost + *umbra*, shadow). When the shadow of an opaque object is thrown upon a surface at some distance from it by a light of considerable apparent size, it is observed that the shadow is divided into two portions, a dark portion in the centre, and a lighter portion surrounding it. The former is known as the *umbra*, or complete shadow; the latter as the *penumbra*, or partial shadow. A reference to the figure will



at once make plain their origin and relation; for if S be the illuminating body, E the object whose shadow is cast on the surface, ABCD, it is seen that the small portion, UU′ receives (omitting all consideration of refraction, dispersion, etc., of light) *no* light from S, while the whole surface outside of PPPP′ is completely illuminated. The point P″ receives light from the whole of S; the point F is only half illumined, and that by the lower part of S, the illumination of the points becoming less and less as they approach U′, which

is unillumined. The portion within UU′ is the umbra, and that between the boundaries PPPP′ and UU′ is the penumbra, which, as we have seen, gradually shades from perfect light at the outer boundary to perfect darkness at the inner, so that it is almost impossible exactly to note its limits on either side. This phenomenon, it is evident, can only occur when the illuminating body is of such a size, real or apparent, as to make the angle, P′KU′, of sensible magnitude; and it is equally evident that the nearer the body E approaches the plane on which its shadow is cast, the larger is the umbra and the smaller the penumbra; while by increasing the distance between E and the plane, so that the point L shall fall between them, the umbra is made to vanish, and the penumbra is increased. This is well illustrated by natural phenomena: the shadow of a man cast by the sun on the ground presents almost no penumbra; the shadow of the earth thrown by the sun upon space at the distance of the moon gives a penumbra many times as large as the umbra; and sometimes, when the moon is new at her apogee, for instance, her shadow cast upon the earth exhibits no umbra. Spectators on the earth who see a partial eclipse of the sun are situated within the penumbra, but within the umbra when they observe a total eclipse; while if the eclipse be annular, the umbra does not exist in the shadow cast by the moon on the earth's surface. See ECLIPSE.

PENZA, pĕn'zä. A government of Central Russia, bounded by the Government of Nizhni-Novgorod on the north, Simbirsk on the east, Saratov on the south, and Tambov on the west (Map: Russia, F 4). Area, about 15,000 square miles. The surface is undulating, intersected by numerous ravines and sloping toward the northwest. The district is watered principally by the Moksha, a tributary of the Oka, and the Sura, an affluent of the Volga—both navigable. The climate is harsh, the mean annual temperature at Penza, the capital, averaging 39°. Agriculture, the chief occupation, is favored by a soil of remarkable fertility. Rye, oats, and wheat are the leading cereals raised. Flax is cultivated to a considerable extent, and gardening and stock-raising are well developed. Modern farm methods are making some progress among the peasantry. The manufacturing industries employed in 1895 over 12,000 men, and their products were valued at over $8,000,000. The chief manufactures are spirits, paper, flour, oil, and matches. Population, in 1897, 1,491,215, of whom about 90 per cent. were Great Russians and the rest Mordvins and Tatars.

PENZA. The capital of the government of the same name in Russia, at the confluence of the Penza with the Sura, 440 miles by rail southeast of Moscow (Map: Russia, F 4). It has a monastery and a convent, a mosque, three gymnasia, a real-schule, a seminary for teachers and one for priests, a technical school, a school of drawing, and a picture gallery. The municipality owns the waterworks and directs a pawn shop. Paper, lumber, flour, and various iron products are the chief manufactures. Penza was founded in 1666. Population, in 1897, 61,851.

PENZANCE, pĕn-zăns'. A municipal borough, market, and seaport town in Cornwall, England, on the northwest shore of Mount's Bay, 65 miles southwest of Launceston (Map: England, A 6). It is the most westerly town in England. The town, exceedingly picturesque in situation, stands on a finely curved shore, surrounded by rocky eminences, and is famous for its mild climate. Its esplanade, one of the finest in the west of England, commands charming land and sea views. The chief buildings are the town hall and corn market, and the chapels of Saint Paul and Saint Mary. Its educational institutions include mining and science schools, and a free library. Woolen yarns and cloths are made and the fisheries employ upward of 2000 persons. Agricultural produce, pilchards, china clay, granite, and tin and copper ores produced from the mines of the vicinity are exported; and timber, iron, hemp, and hides are the chief imports. The harbor has two piers, dry docks and wet docks, and a lighthouse. The town owns much remunerative property, wharfs, modern docks, quays, markets, public baths, and water supply. Penzance, meaning 'holy head,' originated in a chapel to Saint Anthony. Edward III. gave it the grant of a weekly market, and in the fifteenth century it was described as 'a place of ships and merchandise.' The Spaniards burned and sacked the town in 1595, and it suffered in the Civil Wars from Fairfax. It enjoyed the privilege of a coinage charter from 1663 to 1838. Population, in 1891, 12,430; in 1901, 13,120. Consult: Millett, *History of Penzance* (Penzance, 1876-80); Lach-Szyrma, *Short History of Penzance* (London, 1878).

PEONAGE. A term loosely used to denote the system of labor formerly prevalent in Spanish America, and especially in Mexico. The system originated in the desire of the Spanish Government to protect the natives from the rapacity of their conquerors. In Mexico the Indians were early given all the privileges of minors, and as such were exempt from compulsory military service, the payment of tithes, aside from a moderate annual tribute, and certain ecclesiastical and legal restrictions, and the royal officials were especially charged with their protection. These privileges and exemptions, however, served equally well as a mark of inferiority, and their natural protectors often took advantage of their helpless political and social condition to force them into virtual slavery. The labor required of the *peones*, as these Indians were called, was of two kinds; the free labor (*obrajes*), a system under which the laborer served by definite contract, with the days of service, tasks, compensation, etc., strictly regulated by the laws of the Indies; and forced labor, as punishment for crime or debt. With the administration of the law in the hands of corrupt officials, it was comparatively easy to extend almost indefinitely the number of the second class, and with the requirement that each Indian must perform a certain number of days' work each year, the condition of laborers of the first class was far from being one of free contract. During the latter period of the Spanish rule many restrictions were adopted to prevent the Indians from falling into debt, and the conduct of employers was so strictly regulated that the condition of the natives was much better than during the first years of Mexican independence.

The principal evils of the system arose from the strict segregation in separate villages of the Indians, which kept from them any opportunities to advance by more intimate contact with a

superior race, and which speedily nullified the first feeble efforts to educate them; and from the feeling of race contempt which their isolated and defenseless condition engendered in their masters. Though in a legal sense the institution itself long since disappeared, the name *peon* is still used to designate the laborer of native or mixed blood, and through his ignorance and credulity many of the worst features of the system are yet fastened upon him. The system as then prevailing in Mexico survived in New Mexico and Arizona a few years after the annexation of the Southwest to the United States, but was removed by national enactment March 2, 1867. Recent revelations have shown that the worst features of the convict labor system of the South, especially as applied to negro prisoners, closely parallel some of the most flagrant evils of early Spanish-American peonage, and consequently that term has been used, though not with strict accuracy, to designate the condition of these convicts.

PEONY (OF. *pione, pioine*, Fr. *pivoine*, from ML. *pœonia*, Lat. *pæonia*, from Gk. *παιωνία, paiōnia*, peony, from *Παιών, Paiōn, Παιάν, Paian*, the physician of the gods; so called because originally regarded as medicinal), *Pæonia*. A genus of plants of the natural order Ranunculaceæ, natives of Southern Europe, Northern Africa, and Asia. The species are large herbaceous or rarely half shrubby perennials often with tuberous roots. The half-shrubby species are known as tree peonies. On account of the beauty of their large flowers, some of the species are extensively cultivated in gardens, and many varieties and hybrids have been originated. The common peony (*Pæonia officinalis*), a native of Southern Europe, is the most generally cultivated species. It produces in early summer large solitary blossoms, usually red or crimson, but varying to white. The white peony (*Pæonia albiflora*), another favorite species, with beautiful white or pink and fragrant flowers, is a native of Siberia, where its roots are used by the Mongolian Tatars as a food. These two species are the parents of many cultivated forms. The Chinese peonies, a large group including many hardy double-flowered and fragrant varieties, are hybrids obtained by intercrossing various species. The term Chinese peony, however, is often applied to several different species. The less common tree peonies are derived mainly from *Pæonia Moutan* and *Pæonia lutea*, which latter is a comparatively recent introduction from China and is as yet not so well known as the other species. It begins to blossom in late spring and produces its yellow flowers for about a month. *Pæonia Moutan*, the commonest of the tree peonies and much larger than the foregoing, attaining a height of 3 or 4 feet, is a native of California and Japan. It blossoms in spring and produces very large and handsome flowers representing a wide range of shade and colors. It is often grown as a greenhouse plant for early spring blossoms. The tree peonies prefer a good, strong sandy loam. They require a rich soil and applications of well-rotted cow manure are very advantageous to the growing plants. They are rather tender, and in many localities require protection. The plants are propagated from cuttings at the base, usually made with a piece of the ripened stem, potted in sandy soil and placed in a cold frame or the greenhouse. They are also grafted in early fall on the roots of *Pæonia albiflora* and *Pæonia officinalis*. The shoots for grafting are without a flower bud and the grafts are potted in sand and kept in cold frames. The herbaceous peonies are commonly increased by divisions of the shoots in fall or spring. New varieties are grown from seed.

PEOPLE'S CHORAL UNION. See CHORAL SOCIETIES.

PEOPLE'S PALACE. An institution at Mile End, London, established to furnish the people of East London with facilities for education and recreation. In 1840 John B. Beaumont left a sum of money, the income of which was to be spent in promoting education and entertainment for the people in the neighborhood of Beaumont Square. This bequest was badly managed until Sir Edmund Hay Currie took the work in hand and added to the $60,000 which remained the quarter of a million he had raised for its extension. In 1882 Walter Besant published his story, *All Sorts and Conditions of Men*, describing a "Palace of Delight." This novel suggested the name for the new enterprise, created a wider interest in the work, and emphasized the recreation idea, for the further development of which the means soon offered. Besant, as trustee, was closely connected with the work. A central location was chosen and Queen's Hall was formally opened by Queen Victoria on May 14, 1887. Technical classes had already been started in temporary buildings in October. Other buildings were gradually added. The institution contains, in addition to Queen's Hall, with its large organ and stage, and a seating capacity of 4600, a library, class-rooms, laboratories, machinery rooms, social rooms, reading rooms, a gymnasium, a swimming tank, and a winter garden. The activities are educational and social. The only religious work is that carried on by voluntarily formed branches of the Young Men's Christian Association. The main object is to furnish boys with a technical training, an opportunity to learn a trade, and wholesome entertainment. There is a day school for boys, limited to 500, which prepares for the technical courses; evening polytechnic classes, scientific classes, language and commercial classes. The technical courses include music, dressmaking, and training for the civil-service examination. A school of art teaches design in relation to the crafts. Its aim is to elevate the taste and improve the skill. Social rooms provide sewing, music for the girls, and reading and billiard rooms for the boys. Debating, athletic, cycling, and rambler clubs are formed among the members. Balls have been given with success. Refreshments are served at a small charge. The library is open to all during the day, to members only in the evening. It is also open on Sundays from 3 to 10 P.M. Several concerts are given during the week to which a small admission fee is charged. There are also Sunday concerts of sacred music at half-past twelve to one o'clock, when the saloons open, and at half-past four and eight in the afternoon. The choral societies of the Palace sometimes give concerts. Exhibitions of pictures have greatly interested the people; as well as 'shows' of chrysanthemums, poultry and pigeons, dogs, cats and rabbits, donkeys and ponies, and exhibits of the work of London apprentices, where prizes and premiums are awarded. The Palace is primarily

for the young, membership being limited to persons from sixteen to twenty-five years; a junior section includes those from thirteen to sixteen. There is a small membership fee for which is received the privilege of attending concerts and other entertainments, the use of the library in the evening, and admission to clubs and classes. The membership the first year was 4200. In 1890 the Drapers Company took the management of the educational work and two years later decided to contribute £7000 annually, while the Charities Commission give £3500.

The *Maisons du Peuple* of Belgium have a similar purpose. They are, however, an outcome of the socialistic movement for coöperative production. They provide a gathering place open to all, where concerts, lectures, and entertainments are given, and books and companionship can be obtained. They are the people's temples.

Jersey City, N. J., has a People's Palace in connection with the People's Tabernacle. A day nursery, baths, swimming tank, a gymnasium, industrial training, and amusements (bowling, billiards, theatricals, dancing) are provided.

The social settlement of to-day is a later development of the People's Palace idea. Institutions like the Educational Alliance and the University Settlement of New York City are organized to meet the need for a more intimate acquaintance with the home life and interests of the poor.

Bibliography. Besant, *All Sorts and Conditions of Men* (London, 1882); *Century*, 18, 163 (1890); *Nineteenth Century*, 27, 344; *Contemporary*, 51, 226; *North American Review*, 147, 56. For Maisons du Peuple, consult Halévy, *Essais sur le mouvement ouvrier en France* (Paris, 1901).

PEOPLE'S PARTY. See Farmers' Alliance; Populist Party.

PEO'RIA. One of the five principal tribes of the Illinois Confederacy. Their home territory was in central Illinois, about the lake of the same name. They shared in the swift decline of the Illinois tribes, largely brought upon themselves by the murder of Pontiac, and were soon reduced to a mere remnant. In 1832 they and the Kaskaskia removed to Kansas, whence in 1854 they again removed to the reservation in the northeastern corner of Indian Territory, where they still reside, confederated with the remnant of the Kaskaskia, Wea, and Piankishaw, the entire body numbering only 180, all probably of mixed blood. See Illinois; Kaskaskia.

PEORIA. An important manufacturing city and railroad centre, the county-seat of Peoria County, Ill., 160 miles southwest of Chicago, on the Illinois River, at the outlet of the expansion called Peoria Lake, and on the Chicago, Burlington and Quincy, the Chicago and Alton, the Chicago, Peoria and Saint Louis, the Chicago, Rock Island and Pacific, the Iowa Central, the Lake Erie and Western, the Toledo, Peoria and Western, and other railroads (Map: Illinois, C 3). The city occupies an area of more than $8\frac{1}{4}$ square miles on a plateau, and is surrounded by a fine rolling country. There are 43 miles of paved streets (principally brick and asphalt), 50 miles of street railways, 75 miles of sewers, and a well-conducted system of parks and drives, the public park system comprising about 350 acres and including Glen Oak and Bradley parks. A soldiers' monument is among the attractions of the city, as is also a wagon bridge across the Illinois River. The city hall and court-house are handsome buildings. Peoria has a public library of 75,000 volumes and the Peoria Law Library, Bradley Polytechnic Institute, and Spalding Institute. It is an important commercial centre, controlling a large trade both by rail and river. It is also a great grain market, and its live stock and meat-packing interests are extensive. The manufacturing establishments include distilleries, glucose works, strawboard mills, wagon works, malting houses, breweries, wire-fence works, a peanut-roaster factory, agricultural implement works, foundries and machine shops, lumber mills of various kinds, and flouring mills. In the production of high wines Peoria ranks first among cities of the United States, the output of its distilleries, according to the census of 1900, being valued at $26,792,000. A very small amount of whisky is made in Peoria, the high wines being sent to rectifying establishments to be changed into whisky.

The government is vested in a mayor, elected every two years, a council, and in administrative officials who are all, with the exception of the treasurer, city clerk, city attorney, and police magistrate—these being chosen by popular vote—nominated by the executive, subject to the consent of the council. Peoria spends annually in maintenance and operation about $610,000 the principal items being $234,000 for schools, $80,000 for the fire department, $80,000 for the police department, and $37,000 for municipal lighting. The valuation of property (real and personal) is assessed at over $10,000,000. Population, in 1880, 29,259; in 1890, 41,024; in 1900, 56,100, including 8900 persons of foreign birth and 1400 of negro descent. Since the census of 1900, North Peoria, which had a population of 2358, has been annexed to Peoria.

In 1680 La Salle visited the site of Peoria and built near here Fort Crevecœur, which, however, was soon abandoned. Some time in the eighteenth century French traders settled here. In 1812 General Craig of the United States Army broke up their settlement, suspecting them of assisting the Indians. The present city really dates from 1819. In 1835 Peoria (named from the Peoria Indians) was incorporated as a town, and in 1845 it was chartered as a city. Consult Ballance, *The History of Peoria* (Peoria, 1870).

PEPI, pā'pē. The name of two Kings of Egypt of the Sixth Dynasty.—Pepi I., the greatest monarch of this dynasty, reigned for some twenty years about 2500 B.C. Memorials of him are found throughout Egypt from Elephantiné to Tanis, as well as in various mines and quarries. An inscription carved on the rocks of the Wâdi Maghâra, in the peninsula of Sinai, records the fact that he sent an expedition thither in the eighteenth year of his reign, and there is other evidence of his military activity. An official named Una, in an inscription found at Abydos, relates that, at the command of King Pepi, he gathered an army, chastised the Bedouins of the Sinaitic peninsula in several expeditions, and conducted an expedition against a more distant Asiatic country, whose name has not yet been identified. Pepi was the founder of Memphis (q.v.), which took its name from the King's pyramid Men-nofer, erected in the vicinity. This pyramid, which

is situated near the modern village of Sakkara, was opened in 1881, and its inner walls were found to be covered with religious texts. The successor of Pepi I. was his son, Mer-en-rē, and he, dying after a brief reign of four years, was succeeded by his brother Pepi II., of whose reign little is known. According to the Turin papyrus he reigned for ninety years, while Manetho, who calls him Phiops, states that he reigned for a hundred years. His pyramid at Sakkara was opened in 1881; it contains religious texts similar to those found in the other pyramids of this dynasty. Consult: Petrie, *A History of Egypt* (3d ed., New York, 1897); Budge, *A History of Egypt* (ib., 1902).

PEP'IN, or **PIP'PIN.** The name of several Frankish mayors of the palace, ancestors of the Carolingian kings. Pepin the Elder (died 639), also known as Pepin of Landen, was the first of the name to become prominent. He was *major domus* of King Dagobert I. of the Franks, and, together with his friend Arnulf, Bishop of Metz, controlled the policy of the State. The son of Arnulf was Ansegisel, and he married Bega, the daughter of Pepin. Their son was Pepin of Heristal (died 714), who became *major domus* in the eastern part of the Frankish realm, known as Austrasia, about 679. For several years he waged an unsuccessful war against Ebroïn, *major domus* of Neustria or West Frankland, until in 687 he won a decisive victory at Testry, which gave predominance to Austrasia, the Germanic part of the Frankish country, over Neustria, which on the whole was Celtic. Pepin became the ruler over all the Franks, completely overshadowing the various kings. His natural son was the famous Charles Martel (q.v.).—Pepin the Short (714-768) was King of the Franks from 751 to 768. He was the second son of Charles Martel, and hence a grandson of Pepin of Heristal. In 741 he and his brother Karlmann received the office of mayors of the palace. In 742 they found it necessary to place a Merovingian, Childerich III., upon the throne which their father had left vacant. For some years the two brothers ruled conjointly, but in 747 Karlmann abdicated and became a monk, and later abbot of Monte Cassino. In 751, supported by the Pope, Pepin was crowned king, thus becoming the first king of the Carolingian dynasty. Childerich was compelled to enter a monastery. In 754 Pepin was made patrician of Rome. Soon after he made an expedition into Italy against the Lombards, whom he conquered. The portion of the Exarchate of Ravenna which the latter had seized Pepin gave to the Pope. (See Aistulf.) In the following year he made another expedition against the Lombards, whom he subdued thoroughly, and renewed his gift to the Papacy. This is sometimes called the Donation of Pepin (q.v.). Besides overcoming the Lombards, Pepin conquered Aquitaine, took some cities from the Saracens, added Bavaria to his empire, and began the wars against the Saxons which his son Charles was to wage successfully. Pepin was closely associated with the great missionary Boniface (q.v.), and did much to strengthen the relations between the Papacy and the Franks. He died September 24, 768, and was succeeded by his sons Karlmann and Charles the Great (q.v.). Consult: Bonnell, *Die Anfänge des karolingischen Hauses* (Berlin, 1866); Fustel de Coulanges, *Histoire des institutions politiques de l'ancienne France* (Paris, 1892); Waitz, *Deutsche Verfassungsgeschichte* (Kiel, 1879-96); Oelsner, *Jahrbücher des fränkischen Reiches unter König Pepin* (Leipzig, 1871); Hodgkin, *Italy and Her Invaders*, vol. vii. (Oxford, 1899).

PEPIN, Lake. An expansion of the Mississippi River, forming the boundary of Pierce and Pepin counties, Wis., on the northeast, and Goodhue and Wabasha counties, Minn., on the southwest (Map: Minnesota, F 6). It is 27 miles long, extending from Red Wing south to the mouth of the Chippewa River, and from two to three miles wide. The lake is surrounded by bluffs of limestone, rising some 400 feet, weather-beaten into fantastic shapes.

PEPITA JIMENEZ, pā-pē'tä hē-mā'näth. A romance by Juan Valera (1874), the story of a young seminarist, whom the power of a natural love overcomes, in spite of his churchly training.

PEPOLI, pā'pō-lē, Gioacchino Napoleone, Marquis (1825-81). An Italian statesman, grandson of Murat. He was born at Bologna, and married at nineteen his cousin, Friederike of Hohenzollern-Sigmaringen. In 1848 he led the national guards with success against the Austrian troops, and when his native city was taken by the Austrians he fled to Tuscany. In 1859, seven years after his return, he was put at the head of the provisional government of Bologna. After the annexation of the Romagna, he entered the Italian Parliament as a member of the Left Centre, and was Ambassador to Saint Petersburg (1863-64) and to Vienna (1868-70). His close relations with the Hohenzollerns and Bonapartes were influential in securing recognition and assistance for the Italian kingdom. From 1868 to his death Pepoli was a Senator.

PEPPER (AS. *pipor*, *piper*, from Lat. *piper*, from Gk. *πίπερι*, *piperi*, *πέπερι*, *peperi*, pepper, from Skt. *pippala*, long pepper). *Piper*. A genus of plants of the natural order Piperaceæ (q.v.), with woody stems, solitary spikes opposite to the leaves, and covered with flowers on all sides, the flowers mostly hermaphrodite. The most important species is common pepper or black pepper (*Piper nigrum*), which is a native of the East Indies, cultivated also in many tropical countries, and extensively in some parts of the new world, its fruit being the most common and largely used of all spices. It is a rambling and climbing shrub, with smooth and spongy stems, 12 to 20 feet in length, and broadly ovate, acuminate, leathery leaves. The fruit is about the size of a pea, of a bright-red color when ripe, not crowded on the spike. In cultivation, the pepper plant is supported by poles, or by small trees planted for the purpose. It is propagated by cuttings, comes into bearing in three or four years after it is planted, and yields two crops annually for about twelve years. When any of the 'berries' of a spike begin to change from green to red, all are gathered, as when more fully ripe they are less pungent, besides being apt to drop off. Pepper was known to the ancients; Hippocrates used it as a medicine. In the Middle Ages pepper was one of the most costly spices, and in the thirteenth century a few pounds of it were reckoned a princely present. The *black pepper* of commerce consists of the dried berries. *White pepper* is the seed freed

from the skin and fleshy part of the fruit, to effect which the dried fruit is soaked in water and then rubbed. Pepper depends for its properties chiefly on an acrid resin and an acrid volatile oil; it contains also a crystalline substance called *piperin*. The fruit of *Piper trioicum*, a species very similar to the common pepper, is more pungent, and is cultivated in some parts of India. Red pepper is chiefly obtained from species of Capsicum (q.v.), especially *Capsicum annuum* and *Capsicum frutescens*, varieties of which are grown in gardens in temperate climates. The larger fruited sorts, green or ripe, furnish peppers for pickling; while the smaller sorts are used in making chili, capsicum, or cayenne sauce for meats, etc. The culture of red peppers is about the same as for eggplant (q.v.). See illustrations of VEGETABLES; FLAVORING PLANTS.

Jamaica pepper (or pimento) is a species of Eugenia, of the natural order Myrtaceæ, and Guinea pepper, or Meleguetta pepper, species of the natural orders Scitamineæ and Anonaceæ. See CAPSICUM; ALLSPICE; GRAINS OF PARADISE; and GUINEA PEPPER.

PEP'PER, WILLIAM (1843-98). An American physician. He was born in Philadelphia, the son of a physician of the same name, a professor in the University of Pennsylvania, and was graduated from that institution in arts (1862) and medicine (1864). His professional advancement was steady and rapid. After a resident hospital service, he became successively curator and pathologist to the Pennsylvania Hospital (1866), visiting physician to the Philadelphia Hospital (1867), pathologist to the latter (1867), lecturer on morbid anatomy at the University of Pennsylvania (1868), visiting physician to the Children's Hospital (1870). In this year he became lecturer on, and in 1876 professor of, clinical medicine, and shortly afterwards he succeeded Alfred Stillé in the chair of the theory and practice of medicine in the University of Pennsylvania. In 1881 he was elected provost of this institution, in which position he displayed conspicuous ability in reorganizing and building up the college. Dr. Pepper was widely noted as a clinician and teacher, and was always in demand as a consultant. He was a member of many medical societies, and was president of the first Pan-American Medical Congress in 1893. For his service as medical director of the Centennial Exhibition at Philadelphia in 1876 he was decorated by the King of Sweden. He was a prominent figure in the social life of Philadelphia. Besides a large number of articles on several medical topics, contributed to journals, Pepper published, with Meigs, a book on *Diseases of Children* (1870; 6th ed. 1877). His most important literary work was the editing of the *System of Medicine by American Authors* (1866), which bears his name. He established (1870) and was for a time editor of the *Philadelphia Medical Times*.

PEPPER BRAND. A disease of cereals. See BUNT.

PEPPER CORN. A disease of wheat. See EARCOCKLES.

PEP'PERELL, Sir WILLIAM (1696-1759). An American soldier, born at Kittery, Me. In 1726 he was elected a representative to the Massachusetts General Court, was next year made a member of the council, and in 1730 was appointed Chief Justice of the Court of Common Pleas. Upon the breaking out of King George's War (q.v.) he enthusiastically favored the attempt of the New England colonies to capture the French stronghold of Louisburg on Cape Breton Island, and lent £5000 toward equipping the expedition. As a result of his activity and influence he was made commander-in-chief. Aided by an English squadron under Commodore Warren, he landed his army, numbering about 4000 men, and began the siege of the fortress on the last day of April, 1745. On the 17th of the following June the place capitulated. Pepperell was in 1746 created a baronet by King George II., and he received other high honors while on a visit to England in 1749. When the French and Indian War began, he was active in raising troops, was commissioned a major-general in the English army, and commanded the forces defending the frontiers of New England. From 1756 to 1758 he was acting Governor of Massachusetts, and in February, 1759, was promoted to the rank of lieutenant-general, but died at Kittery in the following July. He published an account of the *Conference with the Penobscot Tribe* (Boston, 1753). Consult: Usher Parsons, *Life of Sir William Pepperell* (Boston, 1855); Parkman, *A Half-Century of Conflict* (Boston, 1892); and Brooks, *Sir William Pepperell* (New York, 1903), in the "Historic Lives Series."

PEPPER FAMILY. A natural order of plants. See PIPERACEÆ.

PEPPERGRASS (*Lepidium sativum*). A name synonymous with garden cress. See CRESS.

PEPPERIDGE. A North American tree. See BLACK GUM.

PEPPERMINT. A perennial herb. See MINT.

PEPPER-ROOT (*Cardamine diphylla*). A North American perennial herb, of the natural order Cruciferæ, with pairs of ternate leaves, racemes of white flowers, and pungent mustard-flavored roots, used as a condiment.

PEPPER-TREE (so called from the pungent drupes), or PEA-TREE (*Schinus*). A genus of South American and Mexican trees and shrubs of the natural order Anacardiaceæ. The leaves abound in a resinous or turpentine-like fluid, which is discharged when the leaves become turgid. After rain they fill the air with fragrance, and if thrown into water they jump about as if alive, discharging jets of this peculiar fluid. The twigs have also a strong odor of turpentine. One species, Schinus Molle, a rapidly growing tree, which attains a considerable size, has been extensively introduced into California. See Plate of POPPY AND PEPPER-TREE.

PEPSIN (Fr. *pepsine*, from Gk. πέψις, *pepsis*, a cooking, from πέσσειν, *peptein*, to cook; connected with Lat. *coquere*, Skt. *pac*, to cook). An active ferment present in the gastric juice, which has the property of converting the proteid elements of the food into peptones. Pepsin is known to be one of the albuminoids or nitrogenous organic substances, but has never been satisfactorily isolated, and its presence is known only by its effects. Pepsin requires for its action the presence of an acid and moderate warmth. As used in medicine it occurs in a fine yellowish-white amorphous powder, or in translucent grains

or scales. It is extracted from the glandular layer of the stomachs of freshly killed pigs, and should be capable of digesting not less than 3000 times its own weight of albumen. It has, however, been isolated in such a pure form as to be able to digest 25,000 times its own weight of egg albumen. The use to which it is put is to aid gastric digestion in very old or feeble persons where the gastric juice is deficient. The enzyme does not act on carbohydrates or fats, and is therefore perhaps inferior for general use to pancreatine (q.v.). See DIGESTION.

PEPTONES. See PROTEINS.

PEPYS, pēps, pēps, *or* pēp'is, CHARLES CHRISTOPHER (1781-1851). An English jurist, first Earl of Cottenham and Lord Chancellor. He was born in London, was educated at Harrow and Trinity College, Cambridge, and was called to the bar in 1804. In 1830 he was appointed Solicitor-General, and in the following year was elected to Parliament. In 1836 he was made Baron Cottenham and Lord Chancellor in the Melbourne Administration, resuming the post in Lord John Russell's first Government. In 1850 he was made Viscount Crowhurst and Earl of Cottenham.

PEPYS, SAMUEL (1633-1703). A well-known English diarist. He was born February 23, 1633, the son of a London citizen, a tailor, but was well educated, first at Saint Paul's School, and afterwards at Magdalene College, Cambridge. His cousin, Sir Edward Montagu (later Earl of Sandwich, q.v.), introduced him to public employment. In 1660 he was appointed clerk of the acts of the navy, and in 1673 secretary for the affairs of the navy. He was an excellent public servant, acute, diligent, and laborious; but during the fanatical excitement of the Popish plot (see OATES, TITUS), he was committed to the Tower on an unfounded charge of aiding in the design to assassinate the King and extirpate the Protestant religion. Having been discharged without a trial, Pepys was restored to his post in the Admiralty, which he retained till the Revolution of 1688. He subsequently suffered a short imprisonment on the charge of being a Jacobite (1689-90). For two years (1684-86) he held the honorable station of president of the Royal Society. He died May 26, 1703. Pepys wrote *Memoirs of the Royal Navy* (1690), and has been credited with *The Portugal History, 1667-68, by S. P. Esq.* (1677). He left to Magdalene College his large collection of books, manuscripts, and prints, including about 2000 ancient English ballads, forming five folio volumes. This curious collection was begun, he says, by Selden, and continued down to the year 1700, when the form peculiar to the old ballads, namely, the black letter with pictures, was laid aside for the simpler modern fashion. Pepys is now remembered for his *Diary*, deciphered by the Rev. J. Smith from the original shorthand manuscript in the Pepysian Library, Cambridge, and first published in a mutilated form under the editorial care of Lord Braybrooke in 1825. It begins January 1, 1660, and is continued for about nine years, when the diarist was obliged from defective eyesight to abandon his daily task. As a picture of the Court and times of Charles II. this *Diary* is invaluable; the events, characters, follies, vices, and peculiarities of the age are presented in true and lively colors, and the work altogether is one of the most racy, unique, and amusing books in the language. It has often been printed, but all the editions are fragmentary except the last by Wheatley in eight volumes (London, 1893-96), which is accurate and complete except for the omission of a few of the most offensive passages. The same editor has also published *Samuel Pepys and the World He lived In* (London, 1880). Some hitherto unpublished letters of Pepys are to be found in *The Academy*, vol. xxxviii. (ib., 1890), and *The Athenæum*, vol. xc. (ib., 1887). Consult also: Tanner, "Pepys and the Popish Plot," in *The English Historical Review*, vol. vii. (ib., 1892); Stevenson, "Samuel Pepys," in *Familiar Studies* (ib., 1892).

PE'QUOT (from *Paquatanog*, destroyers). A warlike Algonquian tribe formerly occupying the coast region of eastern Connecticut from the Rhode Island border westward to beyond the Thames. They were originally a part of the Mohegan of the Connecticut River, and appear to have acquired their later name by their successful invasion of the coast country until then held by the Niantic. The two tribes continued to be one people until the succession of Sassacus about the time of the English settlement, when a younger chief, Uncas, seceded with his party, who thenceforth acted as a distinct tribe, retaining the old name of Mohegan. By his diplomatic alliance with the English against his rival, Uncas was able to secure for himself and his tribe the dominant influence. Before the collision with the English, Sassacus had successfully enforced his rule over all the various bands of Connecticut from the Narraganset country westward to about the present New Haven, together with the greater part of Long Island. At the period of their greatest strength the Pequot probably numbered at least 3000. By the murder in July, 1636, of a trader, John Oldham, who had maltreated them, the Pequot became involved in a war with the English in 1637. Through the influence of Roger Williams and Uncas, the English secured the aid, or at least the neutrality, of the neighboring tribes, and then marched against the Pequot, who were thus left to fight their battles alone. On May 26 (O. S.), 1637, their principal fort, near Mystic River, was surprised and set on fire by a company of about 90 whites, under Capt. John Mason (q.v.), aided by a small force of Indians, and probably 600 Pequot men, women, and children perished in the flames or were shot down while trying to escape. The loss of the English was only two. The tribe was so crippled by the terrible slaughter that after a few desperate but unsuccessful efforts at resistance they determined to separate into small parties and abandon their country. The principal body, headed by Sassacus, attempted to escape to the Mohawk, but was intercepted and nearly every person was either killed or captured. The few who escaped to the Mohawk, including Sassacus himself, were killed by that tribe. Scattered fugitives were shot down wherever found until the few survivors at last came in and asked for mercy at the hands of the English. All prisoners taken had been sold into slavery, many to the West Indies, and those who now surrendered were distributed among the other neighboring tribes and forbidden any longer to call themselves Pequot. The Pequot given to the Indian allies of the colonists were treated so harshly by their masters that it

was finally necessary in 1655 to gather them into two villages in their old country and place them under direct control of the Colonial Government. Here they numbered about 1500 in 1674. They decreased rapidly, as did the other tribes, and in 1762 the remnant numbered only 140, who in 1832 had dwindled to 40.

PERA, pā'rà. The foreigners' quarter in Constantinople (q.v.).

PERACAMPOS, pā'rà-käm'pōs, Don Juan von Halen, Count of. See Halen, or Halem.

PERÆ'A (Lat., from Gk. Περαία, *Peraia*, from περαῖος, *peraios*, beyond, from πέραν, *peran*, on the other side). A name given to a part of Palestine, east of the River Jordan, anciently belonging to the tribes of Reuben and Gad. Josephus (*Bel. Jud.*, iii. 3, 3) bounds it on the north by Pella, east by Philadelphia, south by the castle of Machærus, and west by the Jordan. Elsewhere (ib., iv. 7, 3 and 6) he names Gadara as the capital. It is probable, however, that Peræa extended as far north as the Yarmuk and south to the Arnon. The district is a high tableland, cut up by deep watercourses. It is naturally a fertile region, provides good pasturage, and the olive and the vine flourish there. In the earlier days of the Maccabees it was inhabited chiefly by 'Gentiles,' but by the beginning of the Christian Era the population had become prevailingly Jewish, and Peræa sent a multitude of Jews to Jerusalem in the uprising against Sabinus. Peræa was the scene of a part of the ministries of John the Baptist and of Jesus, who, according to John x. 40, appears to have been baptized there, and from Peræa He made His last journey to Jerusalem. See Bashan; Gilead; Palestine.

PERAK, pā-rāk'. One of the Federated Malay States (q.v.), situated on the western coast of the Malay Peninsula, bounded by the British Province of Wellesley and the native State of Kedah on the north, the independent States of Petani and Kelantan and the protected State of Pahang on the east, the protected State of Selangor on the south, and the Strait of Malacca on the west (Map: Burma, Siam, etc., D 6). Its area is estimated at about 10,000 square miles. The region is traversed from northeast to southwest by two parallel mountain ranges inclosing the valley of the Perak River. The mountains are highly mineralized; they do not exceed 7500 feet in their highest peaks. There are a number of rivers outside of the Perak and its tributaries, but they are mostly unimportant for navigation. The climate is characterized by intense humidity and is unhealthful for Europeans. The chief mineral is tin, which is mined chiefly in the districts of Kinta and Larut. The output of tin increased in value from $12,339,909 in 1896 to $26,032,000 in 1900, the increase being due exclusively to the rise in the price of the metal. Besides tin Perak has also deposits of gold, silver, iron, lead, copper, arsenic, zinc, manganese, bismuth, etc. According to the census of 1901 mining employed about 78,000 persons, of whom about 76,000 were Chinese. Agriculture plays only a secondary part and a large portion of the region is still covered with forests. The agricultural population numbered nearly 76,000, including over 65,000 Malays. The principal agricultural products are rice, sugar, and coffee. Perak has greatly increased in commercial importance since the establishment of a British protectorate. In 1900 the total commerce of Perak (including interstate commerce) amounted to $43,931,811, of which $29,190,663 represented exports, principally tin, sugar, and coffee. Perak had, in 1900, 114 miles of State railways, connecting the port of Teluk Anson with the mining district of Kinta and Kuala Kangsar, the residence of the Sultan. The revenue of the State is derived principally from the export duty on tin. For the year 1900 the revenue and expenditures amounted to $7,636,126 and $6,144,774 respectively. Perak has increased in population for 1891-1901 from 214,254 to 329,665, or by nearly 54 per cent. The population in 1901 was composed of 150,235 Chinese, 142,168 Malays, 34,760 Tamils and other natives of India, 672 Europeans and Americans, 591 Eurasians, and 1235 belonging to other races. The number of aborigines is given as 7982. Taiping is the administrative capital. The first European settlement in Perak was established in 1650 by the Dutch, who were expelled by the British in 1795. In 1818 Perak fell under the rule of the Siamese, but it regained its independence with the assistance of the British in 1824, and was governed by its own sultans until 1874, when internal dissensions brought about British interference and the appointment of a British resident, who was soon murdered. British authority was reëstablished by means of a punitive expedition and no further manifestation of resistance to British protection has occurred since then. Consult the authorities referred to under Malay Peninsula.

PERAMBULATION OF PARISHES. An ancient custom conducted with much ceremony before the Reformation in England. It took place on one of the Rogation days (q.v.). The clergy, the lord of the manor, and many other persons walked in procession all around the boundaries of the parishes, returning to the church for prayer. The ceremonies were much curtailed at the Reformation, but the custom continued, and, on the plea of immemorial custom, has often afforded evidence in cases of disputed boundary. The origin of the custom has been referred to the Roman festivals of Terminalia and Ambarvalia.

PER CAPITA (Lat., according to heads). A legal term borrowed from the civil law, and employed to denote the kind of succession to the property of a deceased person by which his descendants take according to their number and as individuals, i.e. each takes an equal share. In most jurisdictions descendants in an equal degree of relationship, however remote, take *per capita*, that is, the estate is divided among them in equal shares. The manner of succession and descent is largely regulated by statute in the various States. See Descent; Distribution; Per Stirpes; Succession.

PERCEFORÉT, pārs'fō'rā' (Fr., pierce-forest). A French romance giving the fabled history of Britain before the days of King Arthur, and first printed in Paris in 1528. The time of its production is uncertain, but was probably the latter part of the thirteenth century. The writer hints that the romance was taken from a manuscript found in an English monastery in 1286. The hero, King Perceforêt, so called from his conquest of an enchanted forest, came to Britain with Alexander the Great, after the royal

line of Brut was extinct, and in fulfillment of an oracle was made King. Unlike most romances of chivalry, it deals with enchantments, dreams, and visions rather than with battles and tournaments. In its day it was the most popular romance of its class, and is now valuable for its descriptions of mediæval life and manners.

PERCEPTION (Lat. *perceptio*, from *percipere*, to perceive, from *per*, through + *capere*, to take). A term common both to epistemology and to psychology. The questions how, in general, we come to have knowledge of an 'external' world, and what is the validity of this knowledge when attained, are questions that lie outside of the psychological sphere. Psychologically regarded, perception is either a specific form of mental function or a complex of mental processes, a compound conscious content (percept).

Perception, in its functional significance, is defined by James as "the consciousness of particular material things present to sense." It is single and unitary. By a confusion of contents with function, it is often described as complex; but in the adult mind the impression comes to consciousness *as* perception; we are not conscious of the sum of sensations and of their assimilation and integration: we perceive. Logically, we may split up perception into the part-functions of sensation, reproduction, and integration, just as—from another point of view—we may split it up into discrimination, localization, and integral apprehension or object-intuition. Psychologically, such divisions do not assist us, while they may be dangerous as suggesting that there must be corresponding part-contents to carry the functions. "The perception is one state of mind or nothing." The problem of the psychology of perception, in this first sense, is to test the adequacy of perception to its stimuli, to trace the variation of the perceptive reaction under varying conditions of stimulation (to see, e.g. how it is that the perception of space is predominantly visual, and that of time predominantly auditory), and to follow the development of the perceptive function through the lower orders of mind up to man.

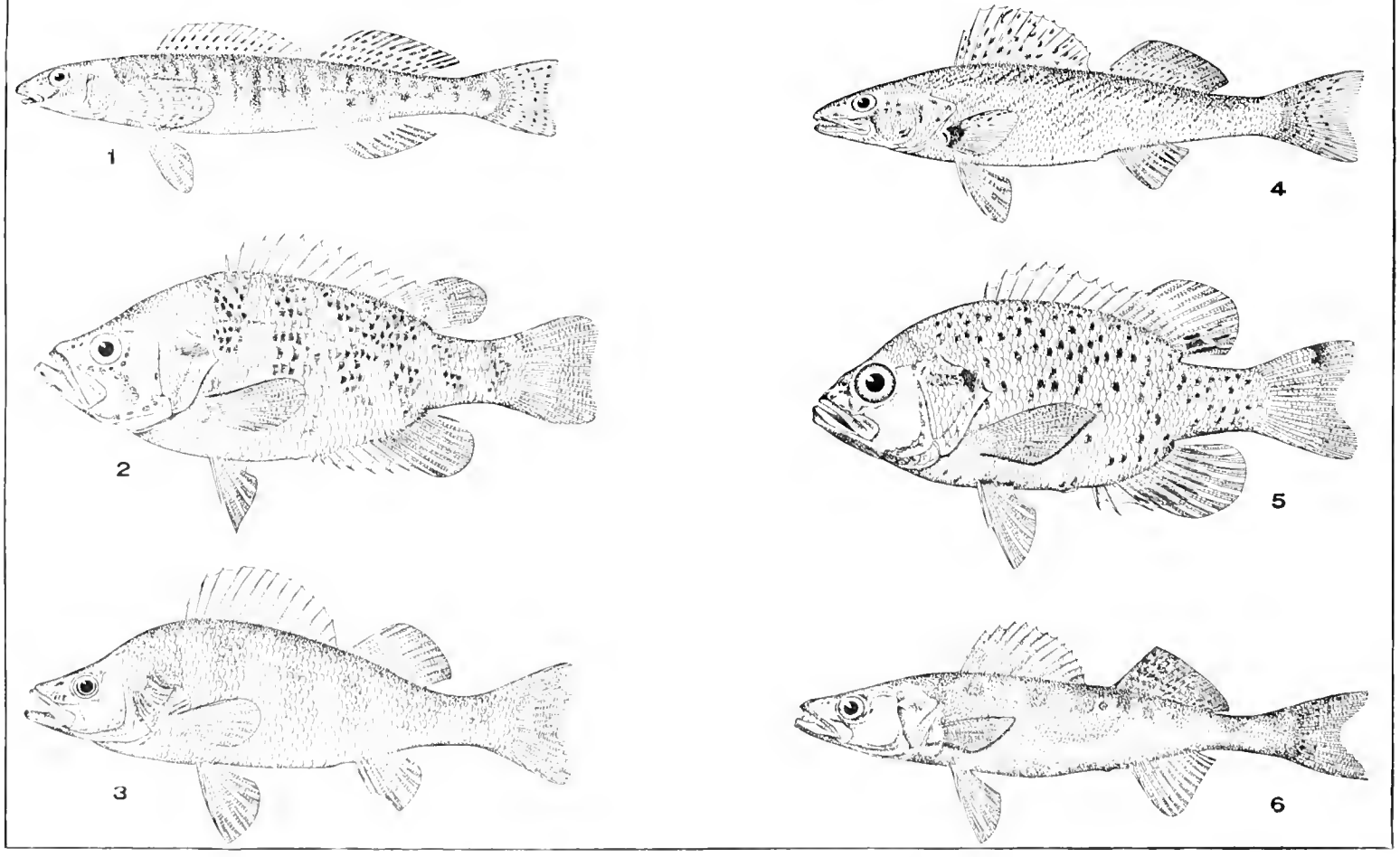
When we turn to the percept, that is, to the contents submitted to structural analysis, we find, on the other hand, an unmistakable complexity. A functionally simple intuition 'contains' a large number of sensation components. The components must not, it is true, be considered as forming a mere sum or aggregate; we do not get a percept by juxtaposing sensations. They are, on the contrary, put together on certain patterns, arranged in certain ways under the conditions laid down by the physiological organism whose sensations they are. In virtue of this arrangement they are, in some cases, intrinsically modified. (See FUSION.) Moreover, they do not remain constant at the different levels of mental development. Sensations that stood in the forefront of the percept at one stage of evolution have retired into the background, or dropped out altogether, at another, while the function of perception is still unchanged. We have, then, a threefold problem before us; to analyze the perceiving consciousness, and so reduce the percept to its lowest morphological terms; to trace the patterns or arrangements of the sense-constituents in perception—patterns of which we are not conscious, but a knowledge of which is necessary if our reconstruction of the percept is to be adequate; and to follow the course of development of percepts, from the simplest to the most highly evolved minds. The first two questions can be answered in the light of observable fact; the third presents greater difficulties than does the corresponding question of the development of function, and must always be answered by an hypothesis, based upon grounds of more or less probability.

Let us take as an illustration the temporal and spatial perceptions: perceptions of locality, magnitude, form, duration, time order, succession, etc. Our first question, as regards function, is: How nearly adequate are these perceptions to the time and space relations of the physical world? What is the least time or least space that we can cognize? What is the least temporal or spatial difference that we can perceive? What are the limits of our apprehension of complex form, of rhythm, etc.? Secondly, we have to explain the fitness of various qualitative and intensive contents (sights, sounds) to carry the spatial and temporal functions. Thirdly, we must trace the growth of these perceptions from childhood onward; and must, wherever possible, push our inquiry back, behind man, to the lower animals. Thus the homing instinct of bees, a localizing function, would come under investigation. On the side of structure the problems are different. In the adult mind extension and duration (qq.v.) are given as attributes of some or all sensations. All that we can do, then, is to trace out the conditions under which these aspects of sensation are turned to account for localization, form perception, perception of succession, etc. The question is one of minute and painstaking analysis. We then inquire if the spatial and temporal formations show any constant difference from (or resemblance to) other modes of perception, e.g. the qualitative; and we find that they represent a common type, the 'colligation' or external connection, sharply contrasted with the fusion of qualitative contents. We then have the genetic problem: the question whether mental process, from the very first, had a temporal and spatial attribute, or whether extension and duration themselves are not formations, constructions, which have by long use been so ingrained into the texture of mind that their mode of origin is no longer discoverable to introspection. So we arrive at the antithesis of 'nativistic' and 'genetic' theories of space and time which still divides psychologists into two distinct schools. The lines of inquiry, functional and analytical, are mutually helpful, but a confusion of their standpoints and problems can lead only to confusion of result.

BIBLIOGRAPHY. Perception is discussed at length in all works upon normal psychology. Consult: James, *Principles of Psychology* (New York, 1890); Wundt, *Physiologische Psychologie* (Leipzig, 1893); id., *Outlines of Psychology*, translated (Leipzig, 1898); Külpe, *Outlines of Psychology* (London, 1895); Titchener, *Experimental Psychology* (New York, 1901). See ASSOCIATION OF IDEAS; SENSATION; INTELLECT.

PERCEVAL, pēr'sī-*val*. The hero of one of the most famous and widespread legends in the Arthurian Cycle. Speaking with the uncertainty which always attaches to any attempt to

PERCHES OF NORTH AMERICA



1. LOG PERCH (Percina caprodes).
2. SACRAMENTO PERCH (Archoplites interruptus).
3. YELLOW PERCH (Perca flavescens).
4. SAUGER (Stizostedion Canadense).
5. WARMOUTH (Chænobryttus gulosus).
6. WALL-EYED PIKE (Stizostedion vitreum).

determine positively the history of these legends, it may be held that the version of the Grail story in which Perceval is the hero is earlier than that in which Galahad holds this place. Those scholars who maintain the theory of a Welsh origin for the whole cycle attempt with determination to identify Perceval with the Peredur of the *Mabinogion* and other Welsh legends; but it is only by straining a possible allusion that any reference to the Grail can be found in them. This feature becomes of prime importance in the romance of *Perceval le Gallois*, begun by Chrestien de Troyes, continued by Gauchier de Dordan, and finished by Manessier in the closing years of the twelfth century. This French version was taken by the great German poet Wolfram von Eschenbach, and adapted rather than translated. In his *Parzival*, the work of his highest genius, rendered additionally famous from its selection by Wagner as the basis of a libretto, we get further away from the Arthurian legend proper into regions of Germanic mysticism. Yet, though there are defects of dramatic structure in Wolfram's treatment as a whole, and though we find ourselves in a strange country and the Grail mountain, Montsalvatsch, is altogether in fairy-land, there is in him something higher and larger and more human than in the Western versions. For the Welsh theory consult Rhys, *Studies in the Arthurian Legend* (Oxford, 1891); for Chrestien's romance, the edition by Potvin (Mons, 1866-70); for Wolfram, Hertz, *Parzival* (Stuttgart, 1898), which contains good notes and a rich bibliography, and a rendering in English verse by Weston (London, 1894). See GRAIL; and, for the Wagner treatment, PARSIFAL.

PERCEVAL, SPENCER (1762-1812). An English statesman. He was the second son of John, Earl of Egmont, and was educated at Harrow, and at Trinity College, Cambridge. He was admitted to the bar and soon gained a reputation as an able lawyer. A clever pamphlet on the abatement of the impeachment of Warren Hastings made him favorably known to Pitt. Obtaining a seat in Parliament for Northampton in 1796, he supported Pitt in his policy of war with France and of a strong rule at home. In the Addington Administration he was made Solicitor-General in 1801, and Attorney-General in 1802. In 1807 he abandoned the legal profession to accept the post of Chancellor of the Exchequer under Portland. In this position he conceived and drafted the 'Orders in Council,' which became extremely unpopular. His well-known opposition to Catholicism assured him the favor of George III. He was in fact the real head of the Government; and on the death of the Duke of Portland in 1809, Perceval himself became Prime Minister, uniting to his office of Chancellor of the Exchequer that of First Lord of the Treasury. He was retained in power by the Prince of Wales on his accession to the regency. On May 11, 1812, as Perceval was entering the lobby of the House of Commons, he was shot and killed by a Liverpool broker named Bellingham, who believed that losses he had sustained while in Russia were the fault of the Government. Consult: Walpole, *Life of Spencer Perceval*, including his correspondence (London, 1874); Williams, *Life and Administration of the Right Honorable Spencer Perceval* (ib., 1856); Alison, *History of Europe* (Edinburgh, 1843-44); Jesse, *Memoirs of the Life and Reign of George III.* (London, 1867); Napier, *History of the War in the Peninsula* (ib., 1851); Massey, *History of England During the Reign of George III.* (ib., 1855-63).

PERCH (OF., Fr. *perche*, from Lat. *perca*, from Gk. πέρκη, *perkē*, perch; connected with πέρκνος, *perknos*, Skt. *pṛśni*, spotted). The name rather loosely applied to a large number of fishes having a perciform body. These often belong to very different families. The true perches belong to the family Percidæ and are all fresh-water fishes. In this family the body is elongated, either compressed or cylindrical, and covered with rather small ctenoid scales. There are two dorsals, usually quite distinct, the anterior spinous, and with six to fifteen spines, and the anal with one to two spines. The air bladder is small or entirely wanting. Perches are usually considered typical spiny rayed fishes. There are about 20 genera and 125 species. They are distributed in the cooler regions of the Northern Hemisphere, the majority of the species being confined to Eastern North America. The typical perches (genus Perca) contain the well-known yellow perches of Europe, Asia, and America, which closely resemble one another. The American species (*Perca flavescens*) is a fish well known to all anglers, abounding in the lakes and streams of all the eastern half of the country, as far north as the Saint Lawrence River and Nova Scotia. It reaches the length of a foot, is gamy, and admirable for eating. Its back is olivaceous in color, the sides golden yellow with six or eight broad dark bars, and the lower fins orange-red. It spawns in late winter and early spring, laying eggs in zigzag hollow strings, from two to seven feet long. These fish are carnivorous, and feed largely on smaller fishes, including the fry of some more valuable than themselves. They are extremely numerous in the Great Lakes, where they are caught near shore in seines and gill-nets in vast quantities, and shipped to interior markets to the value of about $300,000 annually. Other local names are 'ringed' and 'raccoon' perch. Other members of this family are the great tribe (subfamily Etheostominæ) of darters, the pike-perches, and log-perches (qq.v.).

Various other unrelated fishes are styled perches. Thus the salt-water 'perches' of California are surf-fishes (q.v.); the 'Sacramento perch' (q.v.) is a rock-bass; the 'white perch' may be a drumfish in the East or a surf fish in the West. See also PIKE-PERCH; PIRATE-PERCH; TROUT-PERCH. Consult: Günther, *Introduction to the Study of Fishes* (Edinburgh, 1880); Jordan and Evermann, *Fishes of North and Middle America* (Washington, 1898); Goode, *American Fishes* (New York, 1888). See Plate of PERCHES OF NORTH AMERICA.

PERCHERON HORSE, THE. A valuable species of horse. It is a native of the Department of Perche, in the northwestern part of France, and ranges from 14¾ to 16 hands in height. It is "of a sanguine temperament mixed in variable proportions with the musculo-lymphatic," according to the description given by the French Government reports. The Percheron closely resembles the Arab type, although in a heavier and grosser form, and were it not that it has been for ages employed for draught purposes, which have imparted to it a bony frame,

an anatomical structure adapted to the work it is called upon to perform, it would bear the nearest type relationship to the Arab horse.

PERCHLORIC ACID, $HClO_4$. A colorless corrosive liquid that may be prepared by distilling potassium chlorate with sulphuric acid, and cautiously redistilling the distillate. When brought in contact with organic substances, such as paper or wood, perchloric acid causes almost explosive combustion. It is a monobasic acid that combines readily with bases to form a series of salts called perchlorates. Perchloric acid and the perchlorates are very stable. The acid is the only one of chlorine acids containing oxygen that can be distilled, although partial decomposition does take place. Potassium perchlorate ($KClO_4$) is formed when potassium chlorate is heated (as in preparing oxygen). Further heating decomposes the perchlorate into potassium chloride and free oxygen. On the other hand, when potassium perchlorate is heated alone, it decomposes with the formation first of the chlorate and chloride of potassum and of free oxygen.

PERCIER, pār'syā', CHARLES (1764-1838). A French architect and designer, born in Paris. With Fontaine, his friend and afterwards his partner, he was a pupil in the atelier of Peyre, and he also drew with Chalgrin, and studied under Alexandre Guy de Gisors. He won the Prix de Rome in 1786. After his return to Paris, he designed furniture and scenery for the Opéra, all in the antique style. He did for furniture what David was doing in painting, and fairly introduced the classic revival of the Empire. Percier and Fontaine were appointed architects for the Opéra, the Louvre, and the Tuileries. They restored the Colonnade, and finished the second story of the buildings on the court in the Louvre; built the chapel, theatre, and other portions of the Tuileries; designed the Arc de Triomphe du Carrousel; the monument to Desaix, the stairway of the Museum of the Louvre (removed by Napoleon III.), and restorations and additions at Versailles, Saint Cloud, and other palaces. Percier also built the tomb of the Countess of Albany at Santa Croce in Florence (1824). About 1814 Percier gave up his connection with Fontaine and worked constantly in his atelier, where he had established a free school of architecture. Together Percier and Fontaine wrote many books on architecture, and Percier alone wrote *Restauration de la colonne Trajan* (1788).

PERCIVAL, pēr'si-val, JAMES GATES (1795-1856). An American poet, geologist, botanist, surgeon, musician, and linguist, born in Kensington Parish, Berlin, Conn. After graduating from Yale (1815) he followed his various callings in West Point, Boston, Philadelphia, Charleston, S. C.; Connecticut, and Wisconsin. He did good work in geology, and his poetry is generally fluent and occasionally striking. A complete edition of it, with a biographical sketch by Erastus North, was published in 1859. Consult Ward, *The Life and Letters of James Gates Percival* (Boston, 1866).

PERCLOSE (OF. *perclose*, *parclouse*, inclosure, from ML. *perclusus*, for Lat. *praeclusus*, p.p. of *praecludere*, to shut off, from *prae*, before + *claudere*, to close). A railing or other inclosure separating a tomb or chapel from the rest of a church.

PERCOIDEA, or **PERCOIDEI** (Neo-Lat., from Lat. *perca*, perch). A large group of spiny-rayed fishes, including the perches and their near relatives. It embraces the families Centrarchidæ, Percidæ, Cheilopteridæ, Centropomidæ, Serranidæ (sea-bass), and others, which are regarded by some ichthyologists as standing at the head of the fish class. The characteristics of this world-wide and important group are given under the names of its various representatives elsewhere described. See PERCH; SEA-BASS; etc. Consult: Jordan and Evermann, *Fishes of North America* (Washington, 1896); Boulenger, *Catalogue of the Pereiform Fishes in the British Museum* (London, 1897).

PERCOLATION (Lat. *percolatio*, from *percolare*, to strain through, filter, from *per*, through + *colare*, to filter, from *colum*, colander). A process used chiefly in pharmacy for extracting the soluble constituents of suitable substances by the gradual descent through them of a solvent liquid, usually alcohol or alcohol and water, technically known as the menstruum. The apparatus in which the operation is performed is called a percolator, and the finished product the percolate. The method is also called the process of displacement, because the solvent, after becoming charged with the soluble portions of the drug, is displaced by fresh portions of the menstruum, which, by its own weight and the pressure of the liquid above, continues downward and is discharged below.

PERCUSSION (Lat. *percussio*, from *percutere*, to strike through, from *per*, through + *quatere*, to strike). In medicine, the method of eliciting sounds by tapping or gently striking the surface of the body, its object being to determine by the nature of the sound the comparative density of the subjacent parts. This method of diagnosis is not of recent date, for we find it mentioned by Hippocrates. It was employed by Auenbrugger in the middle of the eighteenth century and later by Corvissart in the investigation of heart disease, and by Laënnec in diseases of the chest. But as the only way of practicing percussion was by striking the surface itself with the tips of the fingers or knuckles, technically known as *direct* or *immediate* percussion, its value was limited, and it was not until Piorry introduced the *mediate method*—the stroke being made not upon the surface itself, but upon some intervening substance applied closely to it—that the practice became useful. This flat intervening body, made of wood, ivory, or gutta-percha, is called a plexímeter. It is struck either with a small hammer or *plessor*, or with one or more finger-tips. Instead of an ivory or rubber plexímeter the left index or middle finger of the examiner may be used, with its flat surface fitted accurately to the part under investigation. The force of the stroke on the plexímeter—whether the stroke be made with the fingers or the hammer—must vary according as it is desired to elicit the sound from a superficial or a deep-seated part. The surface to be percussed should be exposed, or, at most, only covered with one layer of clothing; and the blow should fall perpendicularly on the plexímeter. When percussion is made over a considerable cavity filled with air—as the stomach or intestines—a hollow, drum-like, or *tympanitic* sound is produced. When any part of the surface of the chest is struck

below which there is a considerable depth of healthy lung-tissue, consisting of small cells filled with air, a clear sound, less loud and hollow than the tympanitic sound, and termed the *pulmonary percussion note*, depending partly on the vibrations of air in the lung-cells, and partly on the vibrations of the walls of the chest, is evolved. When the subjacent substance is solid (as the heart, liver, or spleen) or fluid (as when there is effusion into a closed sac), the sound is *dull* in proportion to the density and want of elasticity of the part struck.

Auscultatory percussion is practiced when, instead of listening to the percussion sounds as transmitted through the air, the stethoscope is placed upon the chest near the point of percussion and the sound conveyed through it to the examiner's ear. See AUSCULTATION.

PERCUSSION, CENTRE OF. See CENTRE OF PERCUSSION.

PERCUSSION CAP. See SMALL ARMS.

PERCY, pĕr'sĭ. The name of a noble family whose head, William de Percy, accompanied William I. to England, and obtained from him thirty knights' fees in the north of England. The representation of the house devolved in the time of Henry I. (1100-35) on Agnes, daughter of the third baron, who married Josceline of Louvain, who assumed the Percy name. The head of the family at the time was one of the chief barons who extorted Magna Charta from King John; and the ninth feudal lord in the reign of Edward I. (1272-1307) maintained, with others of the greater barons, the spiritual independence of the English Crown. This nobleman's great-grandson was a distinguished military commander under Edward III., and, acting as marshal of England at the coronation of Richard II., was created Earl of Northumberland. He subsequently, however, took up arms against Richard, and placed the crown on the head of Henry of Lancaster, who became Henry IV. Again dissatisfied with the Government, he joined in rebellion with his son, Henry Percy, surnamed Hotspur, for the purpose of transferring the crown to Mortimer, Earl of March. (See PERCY, SIR HENRY.) The Earl, with the other leaders of this rebellion, fell at Bramham Moor (1408), and his titles became forfeited. These, however, were revived in favor of his grandson, who became Lord High Constable of England, and who was killed at the battle of Saint Albans. This Earl's son and successor (the third Earl) met a like fate on Towton field, fighting in the van of the Lancastrian army. The fourth Earl was murdered by the populace in Northumberland, when ordered by Henry VII. to enforce a subsidy. The execution of the seventh Earl by Elizabeth is part of the history of England. The eighth Earl was committed to the Tower, on a charge of being concerned in a plot in favor of Mary Queen of Scots, and died a violent death in prison. The tenth Earl fought in the civil wars against Charles I., though he took no part with the regicides, and eventually joined in the general effort to bring about the Restoration. The eleventh Earl left an only child, who succeeded to the ancient barony of Percy, and marrying Charles, Duke of Somerset, became the mother of Algernon, Duke of Somerset, who was created Earl of Northumberland, with remainder to his son-in-law, Sir Hugh Smithson, of Stanwick, in the County of York, a gentleman of respectable lineage. Sir Hugh, succeeding to the earldom, obtained in 1766 his advancement to the Dukedom of Northumberland.

PERCY, FLORENCE. The pseudonym of Elizabeth Akers Allen (q.v.).

PERCY, GEORGE (1580-1632). A British colonial Governor, born at Lyon House, Northumberland. He was a younger son of the eighth Earl of Northumberland, and, when still young, served in the army in the Low Countries. He sailed for America with the first Virginia colony in 1606, and is said to have named the settlement James Fort. In 1609 he succeeded John Smith as President of the Council until the arrival of Sir Thomas Gates in 1610. In the latter year he was a member of Lord De la Warr's council, and served as Deputy Governor in charge from March, 1611, until the arrival of Sir Thomas Dale in May. He left Virginia in April, 1612, and in 1625 returned to the wars in the Low Countries, where he commanded a company in 1627. He was a bitter opponent of Capt. John Smith, and attempted to show his unworthiness in *A Trewe Relacyon of the proceedings and occurrentes of moment, which have happened in Virginia from the tyme Sir Thomas Gates was shipwracke vppon the Bermudos An. 1609 untill my departure out of the Country which was in Anno 1612* (1625).

PERCY, Sir HENRY (known as Hotspur) (1364-1403). An English military leader, the eldest son of Henry Percy, first Earl of Northumberland. He was knighted by King Edward III. at the same time as the future kings, Richard II. and Henry IV. The next year under his father's guidance he began that service on the Scottish border in which he won his greatest fame, and in 1385 became Governor of Berwick. Here his restless activity soon made him the terror of Scottish marauders and earned him the nickname of Hotspur. As this was the period of the Hundred Years' War, young Percy was several times sent across the Channel to take part in the Continental campaigns, but, though he earned the Garter by his achievements against the French, he always came back to the northern border, where he had been made warden of the marches, and it was there that in 1388 he met a host of Scotch invaders under Douglas, March, and Moray, and fought with them the famous battle of Otterburn, which has been immortalized by the ballad of Chevy Chase. Both armies claimed the victory, but probably what advantage there was lay with the Scots, who, though they lost in Douglas the most renowned of their leaders, succeeded in capturing Percy. In 1399 he joined Henry of Lancaster in his successful rebellion against Richard II.—indeed, the Percys claimed that they made the rebellion successful—and after the coronation of the new King as Henry IV., he was rewarded by the gift of offices and lands which made the already powerful nobleman almost a rival to the King. It was not long before Henry began to feel that the Percys were too powerful for the well-being of his kingdom, and when, as a contrast to an unsuccessful campaign of his own against the Welsh, Hotspur won a brilliant victory over the Scotch at Humbledon Hill, the King began to withdraw his favor from his formidable vassal. The Percys quickly resented this, and forming an alliance with Owen Glendower, the Welsh leader,

the Douglases, and other Scotch families, raised the standard of revolt in favor of the young Earl of March, whom they proclaimed King of England. Henry met the insurgents near Shrewsbury, and a desperate battle was fought in which Hotspur was killed and his forces defeated. Consult: Froissart, *Chronicles;* Wallon, *Richard II.;* Ramsay, *Lancaster and York;* Wylie, *History of Henry IV.;* and Percy, *Reliques of Ancient English Poetry.*

PERCY, John (1817-89). An English metallurgist, born at Nottingham. He studied medicine at Paris and Edinburgh, but afterwards devoted himself to metallurgy, and in 1851 was appointed lecturer in the Metropolitan School of Science, now the Royal College of Science. He published: *Iron and Steel* (1864); *Lead* (1870); and *Silver and Gold* (1880).

PERCY, Thomas (1729-1811). An English antiquary, editor of the *Reliques of Ancient English Poetry*, born in Bridgnorth, Shropshire, April 13, 1729. He graduated from Christ Church, Oxford, B.A., in 1750, and M.A. in 1753; and proceeded D.D. from Emmanuel College, Cambridge, in 1770. In 1753 he was given the vicarage of Easton-Maudit, Northamptonshire, where he remained twenty-nine years. In 1782 he was appointed Bishop of Dromore in Ireland, where he resided till his death, September 30, 1811. Percy published two most important works. While visiting his friend Humphrey Pitt at Shifnall in Shropshire, he found a folio manuscript (early seventeenth century) "lying dirty on the floor under a bureau in the parlour." This manuscript he made the basis of *Reliques of Ancient English Poetry* (1765), a collection of English ballads, which has been aptly called the Bible of the romantic movement. It marks the first decisive return in England to the ballad measure, afterwards to be so beautifully employed by Coleridge. The publication exerted, too, great influence in Germany. To the awakened interest in Norse mythology Percy contributed *Northern Antiquities* (1770), which was a translation of the *Introduction à l'histoire de Dannemarc* (1755) of Paul Henri Mallet. He also edited *The Household Book of the Earl of Northumberland in 1512* (1768), and thus set the example for many similar publications. As a poet he was best known for *The Hermit of Warkworth*, and the ballad "O Nanny, wilt thou gang with me?" Of interest, too, as showing Percy's curiosity, is a translation of a Chinese novel from a Portuguese manuscript (1761). Percy's portrait was painted by Sir Joshua Reynolds, and he was honored by a group of scholars who gave his name to the Percy Society (1840-52), founded for the publication of old ballads. Consult: the *Reliques*, ed. by Wheatley (London, 1891); and the *Folio Manuscript*, ed. by Hales and Furnivall (ib., 1867-68). See also Romanticism.

PERCY ANECDOTES. A collection of popular anecdotes which appeared in forty-four monthly parts (20 vols., 1821-23). They professed to have been written by "Sholto and Reuben Percy, brothers of the Benedictine monastery of Mount Benger." The real authors, who assumed these pen-names, were Thomas Byerley (d. 1826), editor of the *Mirror of Literature*, and Joseph Clinton Robertson (d. 1852), editor of the *Mechanics' Magazine*. The name of the collection was taken from the Percy coffee-house in Rathbone Place, London, where Byerley and Robertson were accustomed to meet. Consult the *Percy Anecdotes*, ed. by Timbs (new ed., 4 vols., London, 1887).

PERDIC'CAS (Lat., from Gk. Περδίκκας, *Perdikkas*). The name of several Macedonian kings.—Perdiccas I., the founder of the Macedonian dynasty, an Argive of the Heraclid or Temenid race, who emigrated to Macedonia about 700 B.C.—Perdiccas II., son and successor of Alexander I., reigned from probably 454 to 413. He was friendly to the Athenians in the early part of his reign, but more or less at enmity with them later on and in the course of the Peloponnesian War.—Perdiccas III., brother of Philip of Macedon, was the successor of Alexander, son of Amyntas, and reigned from 365 to 360.

PERDICCAS. A general of Alexander the Great, a prince of the Macedonian royal line, son of Orontes. He took part in nearly all the important battles fought by Alexander, and, in the distribution of honors at Susa, received for his services a crown of gold and the daughter of the Median satrap for his wife. Alexander, on his death-bed, gave to Perdiccas his signet ring, which was the symbol of royal power. Arrhidæus, the natural son of Philip, being recognized as king, Perdiccas was appointed to the chief military command under the new sovereign. He soon, however, established his influence over Arrhidæus and obtained virtual control of the government. A league was at length formed against him by Antipater, Antigonus, Craterus, and Ptolemy. He marched into Egypt to oppose Ptolemy, but was assassinated in B.C. 321, near Memphis, by his own soldiers.

PERDIDO, *Sp. pron.* pĕr-dē'dō. A small river flowing through Perdido Bay into the Gulf of Mexico on the boundary between Florida and Alabama (Map: Alabama, B 5). In 1803, when the United States came into the possession of Louisiana, the Perdido was claimed by the United States as the eastern boundary. Spain protested and was supported by France. The question was finally settled in 1819 by the Treaty of Washington, when West Florida was ceded to the United States.

PERDITA. The daughter of Leontes, King of Sicily, in Shakespeare's *Winter's Tale*, brought up by a shepherd, and married to Prince Florizel.

PEREDA, pā-rā'dā, José María de (1834—). A Spanish novelist, born in the Province of Santander. He was trained to become a civil engineer, but, being a man of means, he devoted himself to literature, after the publication of his first volume of sketches of manners, the *Escenas montañesas* (1864). In his chief works Pereda gives pictures of mountaineer and seaside life that can hardly be surpassed for detail and charm of description. The *Escenas montañesas* (consult the second series of them, entitled *Tipos y paisajes*, 1871) were long left unnoticed by the general public, yet some of the sketches in the volume, and especially that entitled *La leva*, are among his best works. There came next the *Ensayos dramáticos*, versified dialogues containing studies of manners, and the volume of sketches, *Bocetos al temple* (1876). The collection *Tipos trashumantes* (1877) ex-

hibits various common types of the Province of Santander. *El buey suelto* (1877), an account of the life of an egotistical rake, is interesting as first showing in a marked way the author's inclination to adopt some of the methods of naturalism in the novel. In *Don Gonzalo González de la Gonzalera* (1878) the author sets forth the grotesque character of an electioneering campaign in Spain. In the *Pedro Sánchez* (1884) he portrays the Spanish capital as it was in 1854, and makes us follow his hero through a career of political intrigue and ugly married life. The *Sotileza* (1885) is often deemed his masterpiece, and it is certainly a masterly description of life at the seaside and among the fishing folk. Pereda's later works include: *La Montálvez* (1888); *La puchera* (1889); *Nubes de estío* (1891); *Al primer vuelo* (1891); *Pachín González* (2d ed. 1896). Consult the *Prólogo* of Menéndez y Pelayo, prefacing the first volume of the *Obras completas* of Pereda (Madrid, 1887 et seq.).

PÈRE DUCHESNE, pâr dy'shăn'. See HÉBERT, JACQUES RENÉ.

PÈRE GORIOT, pâr gō'rē'ō', LE. A novel by Balzac (1835). The title character is an old man devoted, to the point of mania, to his unworthy daughters, who forsake him on his deathbed.

PEREGRINE FALCON (OF. *peregrin, pelerin*, Fr. *pèregrine*, from Lat. *peregrinus*, foreign, stranger, from *peregr*, being in foreign places, from *per*, through + *ager*, field; ultimately connected with English *acre*). A species of falcon (*Falco peregrinus*) found in almost all parts of the Northern Hemisphere, and in Africa and South America. The female is about 18 inches long, the male only about 15 inches. The female is the 'falcon' of falconers, and the male the 'tercel.' The peregrine falcon of America is popularly known as the 'duck hawk,' and is regarded by ornithologists as a subspecies (*anatum*) of the European bird; the form from the northwest coast of America is also regarded as another subspecies (*Pealei*). The back, wings, and tail are bluish-gray, the feathers barred with a darker tint; the crown, neck, and a spot below the eye, nearly black; the throat white, with dark longitudinal lines; the breast, belly, and legs, whitish, with dark bars. The wings reach almost to the tip of the tail; and the bird is remarkable for its power of flight. The peregrine falcon can easily fly with a bird or quadruped fully its own weight. Its ordinary prey consists of ducks, grouse, woodcocks, and rabbits. Owing to the quantity of preserved game the peregrine falcon captures, it is ruthlessly destroyed in Great Britain and is in danger of extermination. It makes its nest on ledges of high rocks and lays from two to four eggs. It nested on the Palisades of the Hudson as late as 1899. Numerous localities in Great Britain have long been noted as breeding places of the peregrine falcon, and some of them are regularly visited for the young birds, which are still trained in certain places for the sport of falconry. For the American bird, consult Fisher, *Hawks and Owls of the United States* (Washington, 1893). See Plates of EAGLES AND HAWKS; FALCONS AND FALCONRY.

PEREGRINE PICKLE, THE ADVENTURES OF. A novel by Tobias Smollett (1751). The hero is a savage, coarse fellow, fond of rude practical jokes, outrageous in his behavior to Emilia, and ungrateful to his uncle, Captain Trunnion, who adopted him. The Captain and Lieutenant Hatchway supply the humor of the story.

PEREIRA, pe-rā'rȧ, JONATHAN (1804-53). An English pharmacologist, born in Shoreditch, London. He studied medicine and was licensed by the apothecaries in 1823; became apothecary and chemical lecturer at the Aldersgate Dispensary in the same year; fellow of the Royal College of Surgeons in 1825; professor of materia medica at the Aldersgate Street Dispensary in 1832; professor of chemistry in London Hospital in 1833; took the degree of doctor of medicine in 1840 at Erlangen; was licensed to practice in London in 1841; and became physician to the London Hospital in 1851. Pereira's attention turned early in the direction of the science of pharmacology, in which he became famous. He published many papers on the properties and adulteration of drugs, and many monographs and several text-books on chemistry. His most important work was the *Elements of Materia Medica and Therapeutics* (1839-40), remarkable for the extent of its research, variety of information, and exactness. He also published a *Treatise on Diet* (1843) and *Lectures on Polarized Light* (1854). His other works include a translation of the *London Pharmacopœia* (1824) and *Manual for the Use of Students* (1826).

PEREIRA DA SILVA, pȧ-rā'rȧ dȧ sêl'vȧ, JOÃO MANOEL (1817—). A Brazilian historian, biographer, and literary critic, born at Rio de Janeiro. He studied law in Paris, traveled in Europe, and returned to Brazil in 1841 an ardent Liberal, but after entering politics became a Conservative. He wrote the valuable historical works: *Historia da fundação do Imperio Brazileiro* (1864-68); *Segundo periodo do reinado de Dom Pedro I. no Brazil* (1875); and *Historia do Brazil durante a menoridade de Dom Pedro II. 1831-40* (1882); the biographical sketches *Plutarcho brazileiro* (1866); and in literary criticism, *La littérature portugaise, son passé, son état actuel* (1866) and *A poesia epica* (1889).

PÈREIRE, pȧ'rȧr'. EMILE (1800-75) and ISAAC (1806-80). French bankers, distinguished for having instituted schools for the deaf and dumb in France. They were born at Bordeaux. They early carried on at Paris a small brokerage business. By the construction of the railway from Paris to Saint Germain, the first in France, they established their reputation. In 1852 they founded the Société du Crédit Mobilier (see CRÉDIT MOBILIER), and at its collapse in 1867 lost a large part of the great fortune acquired in its management. Isaac published: *La Banque de France et l'organisation du crédit en France* (1864); *Questions financières* (1877); and *Politique financière* (1879).

PÈRE-LACHAISE, pâr lȧ'shăz'. A cemetery of Paris. See LACHAISE.

PERENNIALS (from Lat. *perennis*, lasting throughout the year, from *per*, through + *annus*, year). Plants whose duration is more than two years, contrasted with annuals and biennials.

PEREYASLAV, pā-rā-yäs'lȧf. A town in the Government of Poltava, Russia, 176 miles west-northwest of Poltava (Map: Russia, D 4). There are ruins of ancient fortifications. The Church of the Assumption was founded in 1010,

although the present structure dates from the seventeenth century. The grain trade is important. The town was conspicuous in the history of Little Russia. Population, in 1897, 14,609.

PÉREZ, pā'rāth, Antonio (1539-1611). A Spanish statesman, minister of Philip II., born at Monreal de Ariza, Aragon. He was a natural son of Gonzalo Pérez, one of the ministers of Charles V. and of Philip, and entered upon administrative duties in 1567, after studying at Louvain, Venice, and Madrid. He was the trusted agent of Philip. In 1578 Juan de Escovedo arrived at Madrid to solicit aid for John of Austria, then engaged in the struggle against the Netherlands. Escovedo incurred the hatred of the King and of Pérez, and with the consent of Philip Pérez brought about his assassination (March, 1578). The family of Escovedo denounced Pérez as the murderer, and all his enemies joined against him. The King at first sought to shield him, but on learning of the relations between Pérez and the Princess of Eboli, mistress of Philip, caused his arrest in 1579. He was tortured and forced to confess his crime. In 1585 he was found guilty of embezzlement while in office and was condemned to a long term of imprisonment. In 1590 he succeeded in escaping to Aragon and demanded protection in the courts of that privileged kingdom. The *justicia major*, or highest court of justice in Saragossa, refused to deliver him up. The King applied to the Inquisition for aid in 1591, and the Aragonese court surrendered him to its agents, but the people rose and liberated him. At last, in September, 1591, Philip II. entered Aragon with a powerful army, abolished the old constitutional privileges of the country, and executed a number of the leaders. Pérez, however, escaped, avoiding the plots which the King laid for his assassination. He was condemned in Spain as a heretic, but was well received in Paris and London. He spent the later years of his life in Paris, and died there November 3, 1611, in great poverty. Pérez wrote an account of his experiences, which was published under the title of *Relaciones* (London, 1594), and other works. Consult: Mignet, *Antoine Pérez et Philippe II.* (Paris, 1845); Muro, *Vida de la princesa de Eboli* (Madrid, 1877).

PÉREZ DE HITA, dā ē'tä, Ginés. A Spanish soldier and author, of the second half of the sixteenth century. Neither the date nor the place of his birth or death is known, but he probably was a native of Murcia. He served under Philip II. during the Alpujarra insurrection, but is better remembered as the author of *Historia de las guerras de Granada* (1595), which covers the period from the battle of Alporchones to the death of Alfonso of Aguilar (1501). There is an edition in Rivadeneyra's "Biblioteca de autores españoles," vol. iii. (Madrid, 1876). Pérez de Hita's history has served as the basis of many subsequent works, notably Irving's *A Chronicle of the Conquest of Granada*.

PÉREZ GALDÓS, gäl-dōs', Benito (1845—). A Spanish novelist, born in the Canaries. In 1863 he went to Madrid to study law. Galdós is one of the most prolific of modern Spanish men of letters. His works are marked by out-and-out revolutionary tendencies. One of the most important divisions of his labors was the composition of the collection of tales that form the *Episodios nacionales*. Of these historical romances, the first two series, embracing some twenty stories, were completed in 1883. Writing them under the inspiration of the *romans nationaux* of Erekmann-Chatrian, Galdós gives with historic fidelity and in great detail an account of the struggle for Spanish independence of the Napoleonic invader. The last novels of the second series bring his treatment of political events down to some fifteen years after the return of Ferdinand VII. In a third series he continues his epopee down to even more recent times, dealing with the Carlist War of 1833-40. Galdós ranks well in the domain of realism and psychology, having written several works generally grouped together as *Novelas de la primera época* and *Novelas españolas contemporáneas*. Of the former group are *Doña Perfecta* (1876), *Gloria* (1877), *La familia de León Roch* (1878), and *Marianela* (1878); of the latter are such stories as *El amigo Manso* (1882), *El doctor Centeno*, *Fortunata y Jacinta* (1887), *Miau* (1888), *Angel Guerra* (1891), etc. The vogue of these novels has been even greater than that of his *Episodios nacionales*. In general, they exhibit the contrast between old and blindly conservative elements of Spanish life on the one hand and the new revolutionary ideas of the modern world on the other. The plays of Galdós are inferior to his novels. Chief among them are: *Realidad* (1892); *La loca de la casa* (1893); *La de San Quintín* (1894); *Los condenados*; *Voluntad*; *Doña Perfecta* (1900); *La Fiera*; *Electra* (1900). Consult: Alas, *B. Pérez Galdós, estudio crítico-biográfico* (2d ed., Madrid, 1889); Pardo Bazán, *Polémicas y estudios literarios* (ib., 1892).

PERFALL, pēr'fäl, Anton, Baron (1853—). A German novelist, born in Landsberg. He was educated at Munich, there married an actress, Magda Irschik, and later settled at Schliersee, in Bavaria. Among his novels treating social-political themes, and several collections of stories, may be mentioned: *Ueber alle Gewalten* (1889); *Dämon Ruhm* (1889); *Truggeister* (1892); *Die Sünde* (3d ed. 1896); *König Erfolg* (1899); *Verkauftes Genie* (1900); *Die Uhr* (1901); and *An der Tafel des Lebens* (1902).

PERFECTIONISTS. The name adopted by John Humphrey Noyes (q.v.) and his early followers. Their first settlement was at Putney, Vermont, the native place of Noyes, whither he retired soon after beginning to preach his peculiar views in 1834, and where he gradually gathered about him a small school of believers, beginning with the members of his own family. A Bible-school was begun in the winter of 1836-37, a chapel was erected, and the members of the community spent much time in study and were active in writing and publishing in advocacy of their belief. In accordance with the teaching of Noyes, they held that Christ had actually returned to earth before the close of the Apostolic Age, that His work of saving from sin was complete, and consequently all who were willing to accept His divine reign lived "no longer under law, but under grace," and could do no wrong. The aim being to live together as one family, all possessions were held in common, and a system of complete communism was gradually worked out, involving the institution of 'complex marriage.' The community was broken up in 1847 by the opposition of their

neighbors. The members who held together founded the Oneida Community (q.v.). Consult Hinds, *American Communities* (Chicago, 1902).

PERFECT NUMBER. A number equal to the sum of its aliquot parts; e.g. 6 is such a number since $6 = 1 + 2 + 3$. If the sum of the aliquot parts is greater or less than the number itself, then the latter is called *redundant* or *defective* ($8 > 1 + 2 + 4$; $12 < 1 + 2 + 3 + 4 + 6$). This classification is due to the Pythagorians.

PERFUMERY (from *perfume*, OF. *perfumer*, Fr. *parfumer*, to perfume, from Lat. *per*, through + *fumare*, to smoke, from *fumus*, smoke; connected with Skt. *dhūma*, smoke). A substance which is prepared for use on account of its agreeable odor. Perfumes have been used from the earliest times. Among the nations of antiquity an offering of delicate odors was regarded as a token of respect and homage. The burning of incense formed a part of the Hebrew as of pagan rituals, and hence its use is frequently referred to in the Old Testament. This practice still continues, particularly in the ceremonials of the Roman Catholic Church. The use of perfumes was common among the Greeks and Romans, and both Pliny and Seneca possessed considerable knowledge respecting perfume-drugs. Among the Athenians perfumes were used at feasts, at funerals, and in theatres, the odor of the violet being generally preferred. Both nations learned the use of the still from the Egyptians and applied it to the manufacture of perfumes. The Arabs were skilled in the preparation of fragrant waters; and it was from them, through the Crusaders, that the art was reintroduced into mediæval Europe. The discovery of the process of distillation, which seems to have been forgotten, gave, in the fifteenth century, fresh impetus to this industry, and at its close distilled oils of benzoin, cedar, cinnamon, rose, and rosemary were articles of commerce.

Perfumes may be divided into two general classes, viz. natural perfumes and the artificial or synthetic perfumes. Natural perfumes are of animal or of vegetable origin; artificial perfumes are chemical compounds which resemble natural perfumes in their odor. Artificial perfumes are also of two general classes. In one, the compounds which produce the perfume in nature have been discovered and then reproduced synthetically; this is the case with vanillin. In the other, only the odor of the natural perfume is imitated in a substance which is itself unlike the substance whose odor it possesses; this is true of artificial musk.

The four principal animal perfumes are musk, civet, ambergris, and castor. *Musk* is the dried secretion of the preputial follicles of the musk deer. A similar substance is secreted by the musk-ox, muskrat, and the Florida alligator. *Civet* is secreted by the Viverra civetta and Viverra zibetha. It is found in a double pouch under the tail, from which it is taken from the living, caged animal, two or three times a week. *Ambergris*, a biliary secretion of the spermaceti whale, is supposed to be produced by a diseased conditions of the organs. It is found floating on the water. *Castor* is a glandular secretion of the beaver. When fresh it is in a semi-liquid condition and is prepared for commerce by drying in smoke. The animal perfumes are valuable for the permanence which their presence imparts to the more evanescent vegetable odors.

The list of vegetable perfumes, if complete, would be very long. The odor of plants may be found in the leaves, as in sage, thyme, and mint; in the bark, as in cinnamon and cassia; in the wood, as in cedar and sandalwood; in the flower petals, as in the rose and violet; in the seeds, as in anise and caraway; in the roots, as in the orris; in the fruit-rind, as in the orange; or it may be secreted in the form of resinous gum from the tree itself, as the camphor and myrrh. Perfumes of the last named class have been used from time immemorial.

A series of patient experiments conducted during the latter half of the nineteenth century by Grimaux, Lauth, and other chemists, resulted in the discovery that natural odors could be reproduced in the laboratory by combining the substances which produce such odors in nature. The synthesis of vanillin, the active odorous ingredient of the vanilla pod, by Tiemann and Haarman, marked the beginning of the manufacture of artificial perfumes on a commercial basis. Tiemann discovered that coniferin, the glucoside found in the sap of the pine, could be split up, by means of dehydrating agents, into glucose and coniferylic alcohol, of which vanillin is the aldehyde. Later it was found that the same substance could be produced more cheaply by the oxidation of eugenol, the chief constituent of the oil of cloves, and it is from this source that artificial vanillin is manufactured. The industry has acquired considerable importance both in Europe and America. Another important perfume is ionone, or the artificial odor of violets. It is obtained by condensing citrol with ordinary acetone in the presence of an alkali, the resulting product being then treated with dilute acids. Mirbane oil, the artificial oil of bitter almonds, is derived from benzene. The benzene is treated in a still with two parts of fuming nitric acid and one part of concentrated sulphuric acid. These acids are added slowly and at the end of the chemical reaction the liquor, on adding water, separates into two layers, one of which, on further purification, produces the mirbane oil. Many other synthetic perfumes have been discovered, some of which are produced as the by-products of other industries, or from what were formerly regarded as purely waste materials. The manufacture of artificial musk was introduced by Baur in 1888. A mixture of isobutyl chloride and toluene is heated with aluminum chloride ('Friedel and Crafts's reaction'). Water is added to the product of this reaction, the compound is distilled, and the distillates are collected, and treated with nitric and sulphuric acids, and the product is washed with water. When treated with alcohol, crystals having a marked odor of musk are produced.

The processes employed in obtaining natural vegetable perfumes are described under OILS (section, *Volatile or Essential Oils*).

The centre of the natural perfumery industry has for many years been in Grasse, France, in whose factories, it is said, the product of 5,500,000 pounds of orange blossoms, 4,400,000 pounds of roses, 400,000 pounds of jasmine, and 330,000 pounds each of violets, cassia, and tuberoses are consumed. The culture of flowers for perfumery is carried on chiefly in Turkey, Bulgaria, Arabia, India, and Syria. In the United States,

according to the Census of 1900, there are 266 establishments engaged in the manufacture of perfumery and cosmetics. The total capital invested is reported at $3,499,168; the total number of employees, 1768, and the total value of the product, $7,095,713 annually. According to the United States Statistical Abstract for the same year the value of perfumeries and other toilet preparations imported was $553,411, and ten years earlier was $444,964.

Consult: Askinson, *Perfumes and Their Preparation* (New York, 1892); Perry, *The Chemistry of Essential Oils and Artificial Perfumes* (London and New York, 1900); Durvelle, *Fabrication des essences et des parfums* (Paris, 1893); Mierzinski, *Die Riechstoffe* (Weimar, 1894); Sawers, *Odorographia: A Natural History of Raw Materials and Drugs Used in the Perfume Industry, Intended for Growers, Manufacturers, etc.* (London, 1894).

PER'GAMON, or **PERGAMUS** (Lat., from Gk. Πέργαμον, *Pergamon*, Πέργαμος, *Pergamos*, Pergamos). An ancient city of Mysia, in Asia Minor, the capital of the kingdom of the same name. The city was situated in the valley of the Caïcus, about 15 miles from the coast. The Acropolis is a lofty hill, about 1000 feet in height, situated between the streams Selinus and Cetius, of which the former flowed through the later lower city, now partly covered by the modern town of Bergama. The early history of the place is lost in legend, which declared that the Greek inhabitants came from Arcadia under Telephus, son of Heracles by Auge, and that the name was derived from Pergamos, grandson of Achilles. In the fourth century B.C. it was the seat of a Greek population, but it was not till the early third century that it rose to prominence. Its impregnable Acropolis was chosen by Lysimachus as a hiding place for his treasure of 9000 talents (about $10,000,000), which he intrusted to a certain Philetærus. In B.C. 283 a revolt of Asiatic cities against Lysimachus enabled Philetærus to become master of the place, and the defeat and death of Lysimachus, two years later, enabled him to consolidate his power at first in dependence upon the Seleucidæ of Syria, but later as independent ruler of the neighboring regions of Mysia and the Troad. In B.C. 263 he was succeeded by his nephew Eumenes I. (B.C. 263-241), who maintained his power against the attacks of Antiochus I. of Syria, and developed the resources and prosperity of his little kingdom, which he ruled under the title of Dynast. His cousin and successor, Attalus I. (B.C. 241-197), really placed the new principality on a firm basis through his victories over the Gauls and Antiochus II., whereby he became master of a great part of Northwestern Asia Minor, and though later he was compelled to relinquish part of his conquests, his wise policy of allying himself with the distant power of Rome against his neighbors of Syria and Macedon, enabled him to leave a well-established kingdom to his son Eumenes II. In addition to his military and political ability, Attalus, who assumed the royal title after his defeat of the Gauls, did much to make his capital the centre of the artistic and literary life of Asia. He erected near the city a splendid temple and grove in honor of Athena Nikephoros (Bringer of Victory) and also splendid artistic monuments of his triumphs. To these groups belonged the bronze originals of the well-known Dying Gaul of the Capitol and the Gaul and his Wife of the Ludovisi Collection in Rome. At Athens he erected the stoa of Attalus and placed on the Acropolis a series of small bronze figures representing the battles of the Athenians with the Amazons and Persians, the Gods with the Giants, and the Pergamenes with the Gauls, possibly reduced copies of his monuments in Pergamum, and now known to us in part through a series of small marble figures in Naples, Rome, Venice, and Paris. Eumenes II. (197-159) continued the Roman policy of his father, and was rewarded after the defeat of Antiochus the Great with the greater part of Asia Minor, except Lycia and Caria. To his reign belong the great altar of Zeus and the development of the great library which seems to have been founded by Attalus I. The former was erected near the summit of the Acropolis, at the north end of the Agora. Here rose a great foundation 16 feet high and about 124 by 114 feet square, crowned with an Ionic colonnade which surrounded the altar proper, a mass of earth and ashes inclosed by a wall with cornice and architectural decorations, and ascended by steps. The platform was reached by a broad flight of steps on the west side of the basis. Around the basis was the great work of the Pergamene artists, a colossal frieze about 400 feet long and 7½ feet high, containing a representation in very high relief of the battle of the Gods and Giants, executed with amazing technical skill and full of variety and vigor of composition, though lacking the ideal dignity and nobility of the best Greek art. A small frieze representing the legend of Telephus adorned the Ionic colonnade. The library was established by the King in the halls which surrounded the Temple of Athena Polias above the Agora, and was enriched with a collection of books rivaling the foundation of Ptolemy at Alexandria. Here, too, was gathered a band of scholars about Crates of Mallos, who developed a school of grammatical study, which in opposition to the Alexandrians, emphasized the anomalies rather than the analogies of language. To Pergamum was attributed the invention of a fine parchment for use in books when the jealousy of the Egyptians endeavored to check the activity of the Pergamenes by prohibiting the export of papyrus paper. Under the brother of Eumenes II., Attalus II. (B.C. 159-138), the traditional policy of friendship with Rome was continued and the prosperity and power of the little kingdom increased by successful wars with Bithynia and Thrace. His nephew, Attalus III. (B.C. 138-133), was a student and writer, especially on agriculture, zoölogy, and botany. He left no heirs, and by his will bequeathed his kingdom freedom under Roman protection. An attempt of a pretender, Aristonicus, to seize the power, led to Roman intervention, and in B.C. 129 the Province of Asia was organized with Pergamum as its capital. The city long remained in this position, the seat of a provincial council, and an important centre of Asiatic trade. On the summit of the Acropolis was the Temple of Augustus and Rome, and later a temple to Trajan was added. It seems to have declined under Byzantine rule, though its strategical importance led to the fortification of the hill with a strong wall. Under Turkish rule this fortress was abandoned, but the unfortified town in the plain continued to exist

and is now a thriving place of some 20,000 inhabitants, bearing the name of Bergama. The recovery of Pergamum is due to Carl Humann, a German civil engineer, whose attention was attracted to the place during a visit in 1864, when he observed the destruction of the ancient remains. After much effort, he induced the Berlin Museum to begin excavations in 1878, and when the third campaign closed in 1886, the upper Acropolis had been cleared, including the site of the altar and the library. In 1901 new explorations were begun on the lower slopes of the hill, with the avowed intention of recovering so far as possible the city of Eumenes. The sculptures recovered are partly in Berlin, where the Great Altar has been set up in its old form, and partly in Constantinople. Consult: Baumeister, *Denkmäler des klassischen Altertums*, title "Pergamon" (Munich, 1887); Ussing, *Pergamon* (Berlin, 1899); Pontremoli and Collignon, *Pergame* (Paris, 1900), with plates and restorations; Humann and others, *Vorläufige Berichte über die Ergebnisse der pergamenischen Ausgrabungen* (Berlin, 1880, 1882, 1888); *Altertümer von Pergamon*, vol. ii., iv., v. 2, viii. (Berlin, 1885-1895); Haehtmann, *Pergamon* (Gütersloh, 1900); and Dörpfeld, *Führer durch die Ruinen von Pergamon* (Berlin, 1902).

PERGOLESE, pĕr'gō-lā'zā, Giovanni Battista (c.1710-36). An eminent composer of the Neapolitan school. Evidence regarding the date and place of his birth is conflicting; probably the correct account is that of the Marchese di Villarosa, his biographer, who states that he was born at Jesi, near Ancona. In 1717 he was admitted into the Conservatorio dei Poveri di Gesù Cristo at Naples, where he studied the violin under Domenico di Matteis, and composition under Gaetano Greco and Durante. Under the conviction that melody and taste were sacrificed to learning by most of the masters of his time, he abandoned the style of Scarlatti and Greco for that of Vinci and Hasse. His first great work was the oratorio of *San Guglielmo d'Aquitania*, composed in 1731. Two years later appeared his opera *La serva padrona*, which gained him universal fame, and which has remained one of the finest examples of its genre; strangely enough, it was practically his only stage success. In the same year he composed *Il prigioniero superbo* and *Il frate innamorato;* in 1734, *Adriano in Siria;* in 1735, *Il Flaminio* and *L'Olimpiade*. In 1734 he received the appointment of *maestro di capella* of the Church of Loretto. In consequence of delicate health, induced, it is supposed, by irregular habits, he removed to Pozzuoli, where he composed the cantata of *Orfeo* and his pathetic *Stabat Mater*. Besides the above-mentioned works, Pergolese composed a number of pieces for the Church, which were better appreciated during his lifetime than were his secular compositions; also a violin concerto, and thirty trios for violin, violoncello, and harpsichord. His works are all characterized by sweetness and freedom of style. His orchestration was particularly simple, confined chiefly to the strings, reënforced occasionally by the horns and trumpets. An undoubted reason for the contemporary failure of much of his operatic music was his innovation in style, wherein he abandoned the old contrapuntal accompaniments, and supported his melodies and voices with harmonically written accompaniments. He died of consumption at Pozzuoli.

PERI, pā'rē (Pers. *parī*, fairy, Av. *pairikā*, female demon). In Persian folk-lore, a class of fairies, both male and female, of surpassing beauty. In the old Iranian religion, on the other hand, the Peri was a female demon or enchantress of the utmost malignancy. Such a change of concept of a godling from maleficent to beneficent as is found in this instance is a rare phenomenon in comparative religion, although the transformation of the gods of one religion into the demons of another frequently takes place.

PERIAGUA, pĕr'ē-ä'gwä. See Pirogue.

PERIANDER (Lat., from Gk. Περίανδρος, *Periandros*). A tyrant of Corinth from about B.C. 625 to 585. He was a son and successor of the tyrant Cypselus. He was energetic as a warrior, and distinguished as a patron of poetry and music, and is by some reckoned as one of the Seven Wise Men of Greece. He was, however, cruel and despotic. He is said to have put to death his wife, Melissa, while his son Lycophron was sent to reside at Coreyra, which was then under Periander's rule. Later, when Periander, wishing to see his son, undertook to visit Corcyra, the Coreyreans, terrified at the prospect and hoping to avert the visit, put Lycophron to death. Periander, as tyrant, had under his sway, besides Corinth, also Coreyra, Ambracia, Leucas, and Anactorium. Among other forms of literature he is said to have cultivated elegiac poetry especially. Psammetichus, son of Gordius, the last of the Cypselid dynasty, succeeded him.

PERIANTH (from Gk. περί, *peri*, around + ἄνθος, *anthos*, flower). A general name of the outer leaves of a flower. See Flower.

PERIBLEM (from Gk. περίβλημα, *periblēma*, cloak). The embryonic region in stems and roots which lies outside of the plerome (q.v.) and develops into the cortex. In seed-plants (spermatophytes) it is covered by the dermatogen, the embryonic layer which develops the epidermis; but in fern-plants (pteridophytes) it forms the outside of the stem tip. See Stem.

PERIBONCA. A northern tributary of Lake Saint John (q.v.), Canada, over 400 miles long.

PERICARDITIS (Neo-Lat., from *pericardium*, from Gk. περικάρδιον, *perikardion*, membrane around the heart, neu. sg. of περικάρδιος, *perikardios*, surrounding the heart, from περί, *peri*, around + καρδία, *kardia*, heart; connected with Lat. *cor*, Lith. *szirdis*, OChurch Slav. *sridice*, Goth. *hairtō*, OHG. *herza*, Ger. *Herz*, AS. *heorte*, Eng. *heart*, and probably with Skt. *hṛdaya*, Av. *zaraδaya*, heart, or with Skt. *śraddhā*, Lat. *credere*, to trust). An inflammation of the membranous sac investing the heart—the pericardium. This membrane is composed of two layers, a serous one closely attached to the substance of the heart and a fibrous layer loosely enveloping the whole. The surfaces of these two layers are normally in contact and secrete a thin serous fluid which acts as a lubricant and prevents irritation from the constant movement of the surfaces upon each other. The intervening space, which exists only in pathological conditions, is called the pericardial cavity. In common with all serous membranes (q.v.), the pericardium is subject to two varieties of inflammation—the dry or plastic form and that characterized by

effusion of fluid. In the dry variety, which is most common and least dangerous, there is first a dulling of the surfaces involved, due to a fibrinous exudation; constant rubbing roughens these fibrin-coated surfaces; the plastic, sticky material is thrown into ridges or drawn out into shreds, and presents a curiously shaggy appearance—the so-called *cor villosum* or hairy heart of the older writers. This form of pericarditis may terminate by absorption of the fluid, always leaving, however, an adhesion between the two layers; or the process may go on to the 'moist' form—pericarditis with effusion. Here an extravasation of fluid occurs into the pericardial cavity amounting from a few drams to two quarts. This fluid is at first sero-fibrinous or hemorrhagic, but in some cases becomes rapidly purulent. When the amount of fluid is considerable the heart's action is mechanically interfered with, and death may take place from this cause in a few days.

Pericarditis may arise from many causes. The primary form, unassociated with any other disease, is comparatively rare, and occurs only in children. As a secondary process, it is a common affection. Rheumatism is responsible for more than 50 per cent. of the cases; septic processes in other parts of the body are frequent causes; tuberculosis, gout, Bright's disease, scurvy, diabetes, and the eruptive fevers such as scarlatina and typhoid may be complicated by it; and, lastly, it may take place by extension from neighboring structures, as in pleuropneumonia or septic endocarditis, or it may result from a wound.

The symptoms of pericarditis are pain in the situation of the heart, increased by a full inspiration, by pressure upon or between the ribs in the cardiac region, and especially by pressure upward against the diaphragm by thrusting the fingers beneath the cartilages of the false ribs; palpitations; a dry cough and hurried respiration; discomfort or pain on lying on the left side; restlessness; great anxiety of countenance; and sometimes delirium. The pulse usually beats from 110 to 120 in a minute, and is sometimes intermittent; and febrile symptoms are always present. Pericarditis is a disease which occasionally runs a very rapid course, and terminates fatally in forty-eight hours or less. In ordinary cases, however, which terminate in apparent recovery, the disease generally begins to yield in a week or ten days, and excepting that adhesion remains, the cure appears to be complete in three weeks or less. But although these patients *apparently* recover, the pericardial adhesion commonly occasions other structural changes of the heart sooner or later to develop themselves, and in those cases that the physician has the opportunity of subsequently watching, it is observed that fatal disease of the heart, primarily due to the pericarditis, almost always supervenes.

In this disease the patient must be kept absolutely quiet, so as to throw as little work upon the heart as possible. The diet should be light, dry, and nutritious. In the early stages and in robust people, leeches may be applied over the pericardial area, or ice bags may be used to limit effusion. When effusion has taken place a blister will sometimes cause it to be absorbed. In suitable cases diuretics may be given to promote the action of the kidneys, and mild purgation will be of service. When the effusion is so extensive as seriously to embarrass the heart's action it may be drawn off by paracentesis. If the fluid be purulent, however, an incision must be made into the sac, through the chest wall, and the cavity drained.

PER'ICAR'DIUM (Neo-Lat., from Gk. *περικάρδιον*, *perikardion*, membrane around the heart). A conical membranous sac, containing the heart and the commencement of the great vessels, to the extent of about two inches from their origin. It is placed with its apex upward behind the sternum, and to its left side, in the interval between the pleuræ—the serous sacs in which the lungs are inclosed; while its base is attached to the diaphragm. It is a fibro-serous membrane, consisting of an external fibrous and an internal serous layer. The fibrous layer is a strong, dense, fibrous membrane; the serous layer invests the heart, and is then reflected on the inner surface of the fibrous layer. Like all serous membranes, it is a closed sac; its inner surface is smooth and glistening, and secretes a thin fluid which serves to facilitate the natural movements of the heart. It is inflammation of this serous sac which constitutes the disease known as pericarditis. See HEART.

PERICARP (from Gk. *περικάρπιον*, *perikarpion*, pod, from *περί*, *peri*, around + *καρπος*, *karpos*, fruit). The transformed wall of the ovary in the fruit. For example, a pea pod without the peas is the pericarp. See FRUIT.

PER'ICLES (Lat., from Gk. *Περικλῆς*, *Periklēs* (?B.C. 429). The greatest statesman of ancient Greece. His father was Xanthippus, victor over the Persians at Mycale in B.C. 479. His mother was Agariste, the niece of Clisthenes, the lawgiver. He received a careful education and was especially influenced by his two teachers, Damon, a famous sophist and master of music, and the philosopher Anaxagoras of Clazomenæ, to whose teaching he undoubtedly owed the independence of thought and freedom from superstition which raised him above the multitude. Throughout his life Pericles was conspicuous for his singular dignity and aloofness. He avoided convivial gatherings and seldom walked abroad among his fellow citizens. But his eloquence, sagacity, uprightness, and patriotism won recognition from a large part of the Athenians, and for more than thirty years he was the most influential leader in Athens. When he entered on public life, Aristides had only recently died. Themistocles was an exile, and Cimon was engaged in fighting abroad. Pericles from the first attached himself to the democratic party, and under his leadership the complete democratization of Athens was accomplished. Hitherto only the nobler and richer elements in the State had had access to the higher offices, but under his direction all offices were eventually opened to the entire body of citizens. The first step in this new course was the limitation of the functions of the Areopagus, at that time the chief court at Athens. Through the agency of his associate Ephialtes in the year 462-461 measures were passed which deprived the Areopagus of all its important political powers. To it were left jurisdiction only in cases of homicide, the care of the sacred olive trees of Athena, and a share in the supervision of the land sacred to the Eleusinian divinities. Its former functions passed to the Athenian Senate of 500, the popular assembly, and the law courts. Pay for archons was introduced, and later all

officials received a salary for their services. About 458 the third class of citizens, the Zeugitæ, were made eligible to the archonship, and it cannot have been many years before this office was open to all, even the lowest citizens. Furthermore, the members of the Senate were now chosen absolutely by lot from the entire body of Athenians. Thus in the few years after Pericles became prominent most important constitutional changes were carried through at Athens. The opposition of Cimon had been avoided by his ostracism. Pericles's foreign policy seems to have been based on a desire to extend the power and influence of Athens as widely as possible over the Greek States, and he confidently hoped to consummate an Hellenic League which should embrace all Greek States. His attempt to hold a congress for this latter purpose in 448 was unfortunately defeated.

The Athenians, elated by their victories over the Persians and fired by the splendid empire established under the name of the Confederacy of Delos, were eager for foreign conquest. As their naval empire grew, and their trade increased, they came into rivalry with Corinth and Ægina. In 460 they had seized Megara, which led to war with the Spartans, and during the next four years Athens successfully resisted the attacks of Corinthians and Spartans, and in 459-456 reduced Ægina, which was made a tributary member of the Confederacy of Delos. Athens had seized Naupactus also, which gave her a naval station by which she could command the Corinthian Gulf. She also extended her conquest to the north, and by the battle of Œnophyta (457) gained the greater part of Bœotia, only to lose it again ten years later by the battle of Coronea. The war with Persia had continued in the East under the direction of Cimon, who had been recalled at Pericles's suggestion. After Cimon's death in 449, Pericles seems to have thought the struggle against Persia too severe a tax on Athens if she was to continue her efforts against her rivals in Greece, and so in 448 a peace was concluded with the Persians. Athens was now free to attend to her cares at home. She had gradually extended her territory so that, aside from her allies on the mainland, she embraced, under the Confederacy of Delos, as equal or subject allies, nearly all the larger islands of the Ægean, and she furthermore possessed important cities in the north and in the Thracian Chersonese. In 446-445 a thirty years' peace was concluded between Athens and her allies on the one side and the Peloponnesians and their allies on the other. There was, however, strong opposition to Pericles's policy. The party opposed to him was led by Thucydides, whose ostracism in 444 left Pericles the undisputed leader. He apparently had the power to persuade the people to do whatever he thought good, and for fifteen years after his opponent's ostracism he was annually elected to the office of general. Under his direction Athens had been made supreme within her naval empire, and his purpose was to aggrandize Athens even at the expense of her subject States. With the great wealth which came to her treasury Pericles restored the temples destroyed by the Persians and erected new monuments which made Athens the most magnificent city of the ancient world. Most prominent among these monuments were the bronze statue of Athena Promachos, which was erected about 448 at the west end of the Acropolis, and a new temple to Athena Polias. The Parthenon was also built on an enlarged and more magnificent scale and was completed about 438. At the west entrance to the Acropolis a new propylæa was erected and near it the Temple of Athena Nike. The city was also adorned with many other temples and monuments. In the period of Pericles's leadership Athens became a great centre of literature as well as of the fine arts, and philosophy was also transplanted from Ionia and Italy to the soil of Athens, which was destined to be its home for a thousand years. Pericles was not only a great political leader, but was also able in the field, as was shown by his successful reduction of the revolt of Samos in 439.

Athens's prominence at length made her an object of jealousy. In 433 she formed an alliance with Corcyra, a recalcitrant colony of Corinth, and in the winter of 432-431 the Peloponnesians under the leadership of Sparta decided on war against Athens. Pericles summoned the country residents of Attica within the walls of Athens, and allowed the Peloponnesian army to harry the country at will during the summers of 431 and 430. In the latter year the plague broke out in the city and caused many deaths and great dejection. Pericles was deposed from his office, tried, and fined, but soon reinstated through a revulsion of feeling. In the following year he died after a lingering sickness. While Pericles undoubtedly contributed greatly to Athenian brilliancy, his imperialistic schemes made the Peloponnesian War inevitable. (See ASPASIA.) Consult the histories of Greece by Grote, Abbott, Holm, Busolt, and Meyer; Filleul, *Histoire du siècle de Périclès* (Paris, 1873); A. Schmidt, *Das Perikleische Zeitalter* (Jena, 1877-79); and Evelyn Abbott, *Pericles and the Golden Age of Athens* (New York, 1891).

PERICLES, PRINCE OF TYRE. A play remodeled by Shakespeare, probably from one by George Wilkins and Rowley about 1607, when it was produced and printed in 1609, but not in the folio of 1623. The earliest form of the story is Greek in the sixth century. Gower introduced it as "Apollonius of Tyre" in the *Confessio Amantis* (1332). Shakespeare's part is evidently acts iii., v., and partly iv.

PERICYCLE (from Gk. περικύκλος, *perikyklos*, all around, spherical, from περί, *peri*, around, + κύκλος, *kyklos*, circle). A sheath of cells in plants forming the outer layer of the pleirome (q.v.). It is usually continuous, but is sometimes interrupted by projections of vascular tissue, and in a few cases is altogether lacking. The term 'pericambium' was formerly used to designate it.

PERIDIN'IUM. See RED WATER.

PERIDOT Fr. *péridot*, of unknown etymology). A variety of chrysolite used as a gem. It is usually of an olive, pistachio, or leek-green color. It is found in abundance and of good quality in the form of small, olive-green, pitted grains or pebbles, especially in the sands of Arizona and New Mexico, where they are called locally 'Job's tears.' The best quality for gems comes from the Levant.

PERIDOTITE. An igneous rock of ultrabasic composition, essentially free from quartz and feldspar, but consisting mainly of olivine and of one or more of the following minerals: augite,

hypersthene, hornblende, magnetite, and rarely biotite. The peridotites are sometimes known as the magnesian rocks (see also PERKNITE), and as they are poorest in silica and richest in magnesia of any terrestrial rocks, they form a connecting link with celestial (meteoritic) bodies. From the family of the pyroxenites peridotites differ chiefly by containing olivine. Usually of small extent, they occur as more basic masses within areas of gabbro (q.v.) and norite. The average composition of peridotite is: silica, 41 per cent.; alumina, 4 per cent.; sesquioxide of iron, 6 per cent.; protoxide of iron, 6 per cent.; oxide of lime, 6 per cent.; magnesia, 30 per cent.; oxides of the alkalies, 1 per cent.; water, 6 per cent. By processes of weathering, of which evidence is rarely lacking in specimens, peridotites take up water and form serpentine (q.v.), so valuable as a building and ornamental stone.

PÉRIER, pā'ryā', CASIMIR (1777-1832). A French statesman, born at Grenoble, Department of Isère, October 21, 1777. He was educated at the College of the Oratory at Lyons, and served in the Army of Italy during the campaigns of 1798-1800. Returning to Paris, he helped his father and brother to found a banking house, which soon had a large and prosperous business. In 1817, as the result of an attack on the financial policy of the Government, Casimir Périer was chosen as one of the Deputies from Paris, and being repeatedly reëlected, he became one of the leading members of the Opposition under Charles X. In 1828 he was Minister of Commerce and Finance under Martignac. After the overthrow of the Bourbon monarchy, by the Revolution of July, 1830, Périer became a member of the new Government and acted as Prime Minister to Louis Philippe from March 13, 1831, until his death, May 16, 1832. During his tenure of office he repressed Republican outbreaks at Paris and at Lyons, and the Legitimist movement in the South. He also directed the foreign policy of France against Austria with sagacity and ability, and sustained ministerial responsibility against the King and in the Chamber of Deputies. In his efforts to control the cholera epidemic of 1832 he became infected with the disease and his already broken constitution rapidly succumbed. The most prominent disciple of his constitutional policy of *juste-milieu* was Guizot, who has given a picture of his predecessor in his *Mémoires*. Périer's son, Auguste, adopted the name of Casimir-Périer (q.v.).

PÉRIERS, pā'ryā'. JEAN BONAVENTURE DES (c.1500-44). A French poet and philosopher, born at Arnay-le-Duc, Bourgogne. His known literary work began in 1534 with collaboration in the first French translation of the Bible, and two years afterwards he assisted Dolet in his *Commentaries de la langue latine*. He entered into the service of Marguerite, Queen of Navarre (1536), but in the following year fell out of favor with her on the publication of his *Cymbalum Mundi*, a collection of allegorical dialogues, wherein man's philosophy and religion are ridiculed. The book, denounced by Catholic and Protestant alike, was publicly burned, its author ostracized, and it is supposed that he committed suicide. His friends published *Œuvres diverses* (1544), and the *Nouvelles récréations et joyeux devis* (1558). A later edition of his works was published in Paris (1866) and a special one of the *Cymbalum* in 1874.

PERIGEE (from Gk. *περί, peri*, around + *γῆ, gē*, earth). That point in the moon's orbit which is nearest to the earth. The opposite point is the apogee (q.v.). See MOON.

PÉRIGORD, pā'rē'gôr'. A former county of France, forming a part of the Province of Guienne (q.v.), and now included within the Department of Dordogne. It was divided into Upper and Lower Périgord, and the principal town was Périgueux. It was the land of the ancient Petrocorii; was overrun by the Franks in the beginning of the sixth century, and with the rest of Guienne came into the possession of England by the marriage of Henry II. and Eleanor of Aquitaine. In 1454 it was acquired by the House of Albret, and upon the accession of Henry IV. in 1589 was united to France.

PÉRIGUEUX, pā'rē'gē'. The capital of the Department of Dordogne, France, on the Isle, 42 miles southeast of Angoulême (Map: France G 6). It consists of the ancient city of Périgueux, along the river bank—gloomy of aspect, with narrow streets, but large and solidly built houses—and the Puy Saint Front on rising ground, which until 1240 was a separate town. In the old town there are many curious remains of mediæval architecture. The ramparts have been demolished and replaced by boulevards. The Cathedral of Saint Front, dating from the eleventh century, a majestic edifice of Byzantine design in the form of a Greek cross, largely rebuilt since 1853, resembles Saint Mark's at Venice. Other interesting features are the old cathedral of Saint Etienne, the remains of a sixth-century basilica, and the ruins of Roman origin of a vast amphitheatre, of ancient aqueducts, baths, temples, and the remarkable *Tour de Vesone*. The city has a museum of antiquities, a library with over 30,000 volumes, and a handsome seminary. Quarries of building stone are worked in the vicinity, and many hands are employed in cutting and polishing marble. Paper, woolen cloths, silk, cutlery, tools, and tobacco are manufactured and there is a trade in wine, grain, swine, and oxen. The celebrated *pâtés de Périgueux*, made of partridges and truffles, are largely made and exported. Population, in 1891, 31,439; in 1901, 31,976. Périgueux, the *Vesunna* and capital of the Petrocorii, mentioned by Cæsar, was a city of much importance in ancient times. See PÉRIGORD.

PERIGYNY, pēr-ij'i-ni (from Gk. *περί, peri*, around + *γυνή, gynē*, woman, pistil). A condition in flowers in which the sepals, petals, and stamens are borne upon the margin of a cup-like outgrowth around the pistil, as is well shown in the flower of the common cherry. Perigynous flowers are specially characteristic of certain genera of the rose family. See FLOWER.

PERIHE'LION (Neo-Lat., from Gk. *περί, peri*, around + *ἥλιος, hēlios*, sun). That point in its orbit at which a planet is nearest the sun. The point of the orbit opposite to it is called the aphelion (q.v.). The position of the perihelion, i.e. its longitude east or west of the vernal equinox, is one of the seven elements of a planet's orbit. See ELEMENTS; ORBIT.

PERIM, pā-rēm'. An island in the Arabian Sea about 2 miles from the southwestern coast of Arabia, in the Strait of Bab-el-Mandeb (Map: Asia, D 7). Area, about 7 square miles. It is

under British control and has a small garrison and a lighthouse.

PERIM'ETER (Lat. *perimetros*, from Gk. *περίμετρος*, circumference, from *περί*, *peri*, around + *μέτρον*, *metron*, measure). The length of the boundary of a plane figure. See ISOPERIMETRIC FIGURES.

PERINÆUM (Neo-Lat., from Lat. *perinæon*, *perinæon*, from Gk. *περίναιον*, *perinaion*, *περίνεον*, *perineon*, *περινός*, *perinos*, perinæum). The part of the human body which forms the floor of the true pelvis is by anatomists divided into two portions. Of these, the anterior one, situated in front of the anus, is called the *true perinæum*, or urethral (or, in the female, the vaginal) portion of the perinæum; the posterior portion, which contains the anus or termination of the rectum, is called the rectal or anal portion of the perinæum. The anterior portion, or true perinæum, is triangular in form, the apex being in front; the sides, about three inches in length, are formed by the rami of the pubes and ischium, and the base by an imaginary line joining the tuberosities of the ischium, and passing about half an inch in front of the anus. Through this space the urethra passes through a layer of strong fascia—the deep perinæal fascia—to communicate with the bladder, and in this space the opening is made in the operation of lithotomy.

In the female the space usually referred to as the perinæum lies between the vagina in front and the anal orifice behind. Its most important constituent is the anterior portion of the levator ani muscle. The perinæum, including a greater or less extent of this muscle and sometimes also the sphincter ani muscle, is often torn during parturition, and requires suturing for its repair.

PERIOD (Lat. *periodus*, from Gk. *περίοδος*, a going round, circumference, circuit, cycle, sentence, period, from *περί*, *peri*, around + *ὁδός*, *hodos*, road). A term used in chronology in the same sense as cycle, to denote an interval of time after which the astronomical phenomena to which it refers recur in the same order. It is also employed to signify a cycle of cycles.

The Chaldeans invented the *Chaldaic period* or *Saros*, from observing that, after a certain number of revolutions of the moon round the earth, her eclipses recurred in the same order and of the same magnitude. This period consists of 223 lunations, or 6585.32 days, and corresponds almost exactly to 19 'eclipse years.' The eclipse year is the time required for the sun, in his apparent motion among the stars, to complete a circuit from one of the nodes (q.v.) of the lunar orbit back again to the same node. On account of the motion of the lunar nodes, the eclipse year contains only 346.62 days, and 19 such years contain 6585.78 days. The error of the *Saros* is thus only 0.46 day (about 11 hours) in 223 lunations, or 19 eclipse years.

Various important periods or cycles are used in the calendar (q.v.) for predicting the dates of new and full moon. These phases recur on the same dates every nineteen years (except that leap years may change the dates one day), which fact was discovered by Meton, an Athenian, who invented (B.C. 432) a lunar period of 6940 days, or 19 years, called the *Metonic cycle* (q.v.), also the *lunar cycle*. The *calippic* period consists of 76 years, or four Metonic periods, and is thus able to take account of leap years. The period of the *heliacal* or *solar cycle*, after which the same day of the month falls upon the same day of the week, consists of 28 Julian years of $365\frac{1}{4}$ days each. If the year had regularly consisted of 365 days—that is, one day more than an exact number of weeks—it is evident that at the end of seven years the days of the month and week would again correspond; but the introduction of an intercalary day into every fourth year causes this coincidence to recur at irregular periods. (To ascertain when the same days of the week and month will recur in the Gregorian calendar, see CALENDAR, section on *Perpetual Calendar*.) The *Julian* period is a cycle of cycles, and consists of 7980 (28 19 15) years, after the lapse of which the solar cycle, lunar cycle, and the indiction (q.v.) commence together. The time of its commencement was arranged so that it will expire at the same time as the other three periods from which it is derived. The year B.C. 4713 is taken as the first year of the period, consequently A.D. 1 is the 4714th year of it. (See CHRONOLOGY; CALENDAR; CYCLE.) Astronomers also use the term period to designate the quantity of time required by a planet or other celestial body to complete a revolution in its orbit. (See ELEMENTS.) In this sense there may be different periods for the same body, according to the point selected as the beginning and end of the periodic orbital motion. The location of the position from which the motion is supposed to be viewed may also change the period materially.

PERIODICAL. In a wide sense, a publication issued, at more or less regular intervals, in successive numbers, which are not related to one another as volumes or parts of a single book or series of books. The word, however, is commonly employed—and is here considered—in a narrower sense which excludes on the one hand newspapers (see NEWSPAPER), or periodical summaries of current, and especially of political, events, and on the other such periodical publications as the transactions of learned societies, year-books, almanacs, and so on. Even within these limits the term includes a great variety of publications which differ so much in object and character that concise description of them is impossible; but it may be said of them in general that they are designed to furnish either information about matters of more than ephemeral interest, or entertainment, or both. They deal either with a single subject—such as literature, or a particular science or industry—or with a group of allied subjects, or with material of the most heterogeneous character. The most important special groups of them are *reviews*, or periodicals devoted especially to the criticism of books, and *magazines*, which are designed to furnish miscellaneous and entertaining reading. In the most popular of the latter class fiction forms an important part of the contents, and pictorial illustrations, often of fine artistic quality, are frequently employed.

EARLY FORMS. The periodical, as thus defined, originated in France in the seventeenth century, and in the form of the critical literary journal. The first example of it is also one of the most famous and the longest lived, for its publication has continued, though with many interruptions, until the present day—namely the *Journal des Savants*. The idea which it embodied was conceived about 1663 by the historian Mézeray, who

proposed to establish a weekly journal in which should be "made known what was happening in the republic of letters." His project came to nothing; but in 1664 Denis de Sallo, Sieur de la Coudraye, under the name of Sieur de Hédouville, obtained the privilege of issuing a periodical of this kind, and the first number of the *Journal des Savants* appeared on January 5, 1665. Its plan included reviews of new books, reports of scientific discoveries, obituary notices, and general information of interest to the learned world. Sallo associated with himself a number of scholars, among them the Abbé Gallois, who succeeded him as editor. The freedom —or, as it appeared to an age not accustomed to the ways of the reviewer, arrogance—with which the new journal criticised both books and (what was more serious) ecclesiastical affairs promptly brought it into trouble, and after the appearance of the thirteenth number it was suppressed. Colbert, however, who recognized its value, decided to reëstablish it, and on Sallo's refusal to consent to the demanded abridgment of his freedom, placed it (1666) in the hands of the Abbé Gallois, who conducted it negligently, issued it very irregularly and practically abandoned it in 1674. In 1675 publication was resumed under the editorship of the Abbé de la Roque, who was succeeded in 1687 by L. Cousin. In 1701 it passed under the editorial control of a commission of literary men and was conducted in this way until 1723. After a year of suspended animation it was reissued under the auspices of the Abbé Bignon and the Abbé Desfontaines. Another interruption of publication was caused by the Revolution in 1792, and an attempt to revive it in 1796 was a failure. It was finally reëstablished (April 15, 1816) under the Restoration and placed under the supervision of a commission representing the different classes of the Institute. Seven years after the appearance of the *Journal des Savants* was founded the second French literary periodical, the *Mercure Galant* of Jean Donneau de Vizé, which, under a variety of titles, continued—with interruptions—to exist until 1825; in 1717 it received the name of *Mercure de France*, by which it is commonly known. In addition to criticism, poetry, and other literary material, it dealt with topics of the most diverse kinds, including current news; and it has, accordingly, a place in the history of journalism. Among its editors were Thomas Corneille, whom Vizé associated with himself in 1690, and Marmontel. In the same year (1672) with the *Mercure Galant*, Claude Blondeau and Gabriel Guéret began the first legal periodical, the *Journal du Palais;* in 1679 appeared the *Nouvelles découvertes sur toutes les parties de la médecine* (3 vols.) of Nicholas de Blegny—memoirs published by an 'academy' at whose head Blegny had placed himself—which may be regarded as the first medical journal; and in 1680 was issued by the Abbé Jean-Paul de la Roque the first prospectus of a religious periodical—the *Journal ecclésiastique*. The publication of the last named was forbidden, and in 1690 La Roque began the *Mémoires sur l'histoire ecclésiastique*, of which however, only one volume was issued. A medical journal—*Les Journaux de Médecine, etc.*—which he started in 1683 was equally unfortunate. Other notable periodicals of French origin (but printed in Holland) dating from the seventeenth century are the *Nouvelles de la république des lettres*, founded by the celebrated Pierre Bayle in 1684, and conducted by him for three years (it survived until 1718); the *Histoire des ouvrages des savants* of Henri Basnage de Beauval, begun in 1687 and continued until the middle of 1709; and the *Bibliothèque universelle et historique* of Jean Leclerc, the noted critic, which was issued in 1686-93.

Beginnings in England. The last quarter of the same century saw the beginnings of the literary and of the scientific periodical in England also. As the first example of the former is commonly reckoned the *Mercurius Librarius; or a Faithful Account of All Books and Pamphlets*, the first number of which appeared in April, 1680. It was announced as a 'catalogue' to be published "weekly, or one in fourteen days at least," and it was in fact nothing more; it contained advertisements, or paid notices of new books, and possessed nothing of the literary character. Of greater importance was the *Weekly Memorials for the Ingenious*, issued 1681-83, which obtained much of its material from the *Journal des Savants*. Between 1685 and 1700 appeared for brief periods several learned publications of the periodical type, derived chiefly from Continental sources. Of a more strictly English character was the *Athenian Gazette* (later called the *Athenian Mercury*)—a kind of 'Notes and Queries'—published weekly from March, 1689-90, to February, 1695-96, by the bookseller John Dunton, with the assistance of Richard Sault and others. The *Gentleman's Journal, or the Monthly Miscellany*, of Peter Anthony Motteux, a forerunner of the modern literary magazine, was issued 1692-93 (2 vols.); it contained verses by Prior, Sedley, Mrs. Behn, Oldmixon, D'Urfey, and others, and miscellaneous prose. The *History of the Works of the Learned*, a review dealing mainly with Continental books, was issued from 1699 to 1712. Its publication was resumed in 1737 and was continued until 1743.

Early German Periodicals. In Germany a beginning was made in 1663 with the *Erbauliche Monatsunterredungen* of Johann Rist, which was followed in 1670 by the first scientific annual, the *Miscellanea Curiosa Medico-Physica* of the Academia Leopoldina. But the most celebrated of all the periodicals which date from this period is the first German literary journal, the *Acta Eruditorum Lipsiensium* (written in Latin), founded by Prof. Otto Mencke in Leipzig, the first number of which appeared in 1682. It was modeled after the *Journal des Savants* and the Italian *Giornale de' Letterati* (see below), and included extracts from new books, reviews, and independent articles. Mencke associated with himself in this work many of the most learned men of the time, among them Leibnitz, Seckendorff, and Thomasius, and the *Acta* became the supreme critical authority in German literature. On Mencke's death in 1707 he was succeeded in the editorship by his son, J. B. Mencke; and in 1732 his grandson, F. O. Mencke, began a new series under the title *Nova Acta Eruditorum*. The *Acta* came to an end in 1782, when the belated volume for 1776 appeared. Outside of the countries above mentioned, Italy alone has possessed learned periodicals dating from this period—the *Giornale de' Letterati* of Francesco Nazzari, founded in 1668 and published until 1679, another with a similar title issued from 1686 to 1697 by Bacchini and Ro-

berti, and the *Biblioteca volante* of Cinelli and Sancassini (1676-1718 and 1733-47).

Modern British Periodicals. From the beginning of the eighteenth century new periodicals have appeared in these and in other countries in ever-increasing numbers and diversity. In England, Daniel Defoe began in 1704 *A Review of the Affairs of France and of All Europe, as Influenced by That Nation*, issued at first weekly, then twice, and later thrice a week. It came to an end, in its original form, in 1712, but was carried on in a new series, called simply *The Review*, until June, 1713. One feature of this review—the contributions of an imaginary 'Scandal Club'—doubtless suggested the periodical essay which became important in the history of English literature. Of these essay-periodicals the most noted are *The Tatler* (1709-10-11) written chiefly by Steele and Addison; *The Spectator* (1710-11-14) of Addison, Steele, Budgell, and others; *The Rambler* (1750-52) of Dr. Johnson. A French Protestant refugee, Michel de la Roche, a friend of Bayle, started in 1710 the *Memoirs of Literature*, a review, independent of foreign sources for its material, though modeled after French works of the kind, which he issued until the end of 1714. In 1725 he began another review, the *New Memoirs of Literature*, which lived for two years, and in 1730 *A Literary Journal*, a continuation of the *Memoirs of Literature*, which came to an end in about half that time. A classical periodical, entitled *Bibliotheca Literaria, Being a Collection of Inscriptions, Medals, Dissertations*, etc., was brought out in 1722 by Samuel Jebb and ran through ten numbers, ending in 1724. La Roche's work was taken up by Andrew Reid, who issued (1728-36) *The Present State of the Republick of Letters*, a review of considerable merit; and by Archibald Bower, whose *Historia Literaria* appeared monthly (1730-34). At this time (January, 1730-31) was published the first and one of the most famous of English magazines, the *Gentleman's Magazine, or Trades' Monthly Intelligencer . . . by Sylvanus Urban, Gent.*, founded by the printer Edward Cave. His original plan, afterwards much widened, was that of a collection or 'magazine' (the first use of the word in this sense) of the essays and news which appeared in the London papers; the title was in other points suggested by Motteux's periodical mentioned above. The magazine met with great success—due chiefly to Cave's energy and practical (not literary) ability—its circulation rising within a few years to over ten thousand copies. In it, in 1732, was begun the publication of Parliamentary debates (of both Houses), under the—necessary—disguise of "Reports of the Debates of the Senate of Lilliput;" Johnson was employed during several years in writing out (largely from his own imagination) the speeches reported. His association with Cave and the Magazine is the chief title of both to fame. After Cave's death, in 1754, it was conducted by his brother-in-law, and later by John Nichols and his son. In 1868 it became a magazine of light literature. It soon had numerous imitators and rivals, the most successful of which was the *London Magazine* (1732-81), established by leading London publishers. Among the most important of the other magazines established during the eighteenth century are: *The Scots Magazine* (1739-1817, from that date to 1826, the *Edinburgh Magazine*); the *Royal Magazine* (1759-71); the *Oxford Magazine* (1768-82); the *European Magazine* (1782-1826); the *Monthly Magazine* (1796-1843); and the *Philosophical Magazine* (1798—). To return to reviews: the *History of the Works of the Learned* found a successor in *A Literary Journal* (Dublin, 1744-49), the first review published in Ireland. *The Museum*, projected by the poet and bookseller Robert Dodsley, appeared in March, 1746, and was issued fortnightly until September, 1747. It was as much a magazine as a review, comprising besides notices of books, essays, mainly upon historical and social topics, by writers of repute, including Spence, Warburton, Horace Walpole, Akenside, and Campbell. From this time on the distinctive characteristics of the modern literary review became more and more prominent and before the end of the century were firmly established.

A notable advance in this direction was made in the *Monthly Review*, founded by Ralph Griffiths (1749) and conducted by him until his death in 1803. It included scientific and literary material as well as criticism, and among its writers (1757-58) was Oliver Goldsmith. The *Review* was carried on after Griffiths's death by his son (until 1825) and others until 1845. The Whig politics and non-conformity of Griffiths led to the founding of the Tory *Critical Review* (1756-1817) by Archibald Hamilton, to which Smollett, Johnson, and Robertson contributed; and this was followed by a number of others, including *The London Review* (1775-80); *A New Review* (1782-86); the *English Review* (1783-96), combined in 1797 with the *Analytical Review* (1788-99); *The Antijacobin Review and Magazine* (1798-1821); and the High Church *British Critic* (1793-1843), begun by Nares and Beloe. An epoch in the history of the English review was made by the establishment of the *Edinburgh Review or Critical Journal*—'to be continued quarterly'—the first number of which appeared in October, 1802. It was designed to be the organ not only of literary, but also of political (Whig) opinion, and was planned so broadly and edited so ably that it almost immediately attained a position of authority which soon became, as Carlyle said, that of "a kind of Delphic oracle and voice of the inspired for great majorities of what is called the 'intelligent public.'" The first of the really great English reviews, it established a standard of reviewing which (though its literary criticism, especially in the early days, has often been inferior) its rivals during the century and more of its existence have not been able to surpass. In it the English review became for the first time a really potent influence in the formation of literary taste and the shaping of political views. Its original projector was Sydney Smith, and he also edited the first number; with the second the editorship was transferred to Francis Jeffrey (later Lord Jeffrey), who retained it until 1829, when he resigned on his election as Dean of the Faculty of Advocates. Among the other earlier contributors were Brougham, who largely determined its political opinions, Scott (during the first few years), Carlyle, Hazlitt, and (from 1825) Macaulay, whose influence upon its character was probably second only to that of Jeffrey. After Jeffrey's retirement the editorship was held successively by Macvey Napier (1829-47), William

Empson (—1852), George Cornewall Lewis (—1863), Henry Reeve (—1895), and Arthur S. Elliot (1895—). In 1902 the *Review* celebrated its centennial.

The great success and rapidly growing influence of this champion of Whiggism caused the Tories to bestir themselves, and in February, 1809, appeared the first number of *The Quarterly Review*, which soon attained a position hardly second to that of its great rival. Its first editor was William Gifford, and among its first contributors were Scott, Southey, Dr. Young, Canning, John Wilson Croker, and Heber. Gifford resigned in 1824, and was succeeded by John Taylor Coleridge, who gave place in 1826 to John Gibson Lockhart, who retained the editorial control of the *Review* until 1853; he was followed by the Rev. Whitwell Elwin (—1860), William Macpherson (—1867), Sir William Smith (—1893), Rowland Prothero (1894-99), and George W. Prothero (1899—). The *Westminster Review* (styled from 1836, when it was combined with the *London Review*, until 1851 the *London and Westminster Review*) was founded in 1824 to promulgate the views of the Utilitarians, Bentham and the Mills. The great quarterlies above mentioned were partisan in their origin and in their principles of editorial management: they were designed to promulgate definite views, literary and political, with which the opinions of their contributors must be in harmony; their articles were accordingly anonymous (though the *Westminster* has not been consistent in the matter). This policy was abandoned by the *Fortnightly Review*, established in 1865 (issued monthly from 1866), which was designed to allow the freest expression of individual opinion with individual responsibility. Its first editor was George Henry Lewes, who was followed in 1867 by John Morley, who resigned in 1882. Among its early supporters were Bagehot, George Eliot, Sir John Herschel, Mill, Huxley, and Spencer. The policy of the *Fortnightly* in these particulars has been followed by other monthly reviews—the *Contemporary Review*, established in 1866, the *Nineteenth Century* in 1877, and the *National Review* in 1883.

Weekly journals dealing wholly or partly with literature, science, and art have existed by the side of the quarterlies and monthlies, among them *The Examiner* (1808-81), *The Literary Gazette* (1817-62), *The Athenæum* (1828—), *The Spectator* (1828—), *The Saturday Review* (1855—), *The Academy* (1869—), and *The Speaker* (1890—).

Hardly less notable than the development of the review during the nineteenth century was that of the magazine. *The New Monthly Magazine* (1814) numbered Campbell, Theodore Hook, and Bulwer Lytton among its editors. A brilliant production was *Blackwood's Edinburgh Magazine* (1817—), which "created a sensation unparalleled in magazine history," due to the wit and audacity of its anonymous contributors, among whom were Lockhart, Hogg, Scott, and John Wilson, the editor. Its most important feature, in those early days, was the famous *Noctes Ambrosianæ*, "in which the leading contributors discoursed with irresponsible wit and incisiveness upon the books, the people, and the events of importance in their day." *Fraser's Magazine* (1830-82, when it became *Longman's Magazine*) is associated with the names of Carlyle and Thackeray. Others of note are *The British Magazine* (1832-49), *The Dublin University Magazine* (1833—), *Tait's Edinburgh Magazine* (1832-61), *Bentley's Miscellany* (1837-68), *Notes and Queries* (1849—), *Macmillan's Magazine* (1859—), *The Cornhill Magazine* (1860—), *Saint James Magazine* (1861—), *The English Illustrated Magazine* (1883—), *Cassell's Magazine* (1877—), *Temple Bar* (1860—), *Review of Reviews* (1890—), *The Strand Magazine* (1891), and *The Pall Mall Magazine* (1893—). These are only a selection from a long list.

Periodicals in the United States. The history of the periodical in the United States begins in colonial times with *The American Magazine*, issued at Philadelphia, February 13, 1741, by the printer Andrew Bradford, a business rival of Franklin's, and edited by John Webbe. The idea was due to Franklin, who had planned an imitation of *The Gentleman's Magazine*, and had incautiously divulged his scheme to Webbe. Franklin's own periodical, *The General Magazine*, was issued on February 16, 1741, its projector thus losing by three days the honor of having edited and published the first monthly in America. Both publications were short-lived, Webbe's perishing with its second number and Franklin's with its sixth. Throughout the entire subsequent development of periodical literature in this country the magazine has taken the first place, reviews having been comparatively few in number and decidedly inferior in quality. The magazines published down to the Revolution number sixteen. Among them were *The American Magazine and Historical Chronicle* (Boston, 1743-46), *The Boston Weekly Magazine* (1743), *The Christian History* (Boston, 1743-44), *The Independent Reflector* (New York, 1752-53), *The New England Magazine of Knowledge and Pleasure* (Boston, 1758), *The American Magazine and Monthly Chronicle* (Philadelphia, 1757-58), *The New American Magazine* (Woodbridge, N. J., 1758-60), *The American Magazine* (Philadelphia, 1769), *The Royal American Magazine* (Boston, 1774-75), and *The Pennsylvania Magazine, or American Monthly Museum* (1775-76). Between the close of the war and the end of the century about forty others appeared, among them *The Columbian Magazine, or Monthly Miscellany* (Philadelphia, 1786-92; from March, 1790, entitled *The Universal Asylum and Columbian Magazine*), *The American Museum, or Repository* (1787-92), of considerable value as a source of historical information; *The Massachusetts Magazine* (Boston, 1789-96), *The New York Magazine* (1790-97), *The Political Censor, or Monthly Review* (Philadelphia, 1796-97), edited by William Cobbett, and *The Farmer's Weekly Museum* (Walpole, N. H., 1790-99). The last was edited from 1795 by Joseph Dennie, the founder, in 1801, of *The Port Folio*. Charles Brockden Brown established in 1799, in New York, *The Monthly Magazine and American Review*, which, with a change of name to *The American Review and Literary Journal*, survived until 1802. He later edited *The Literary Magazine and American Register* (Philadelphia, 1803-08).

At the end of the first decade of the nineteenth century the periodicals published in the United States amounted to nearly thirty in number. Only two of them, however, were in any way notable: *The Port Folio* (Philadelphia) above mentioned, which survived until 1827—up to that

time a phenomenally long life for an American magazine; and *The Anthology and Boston Review* (Boston, 1803-11), which included Ticknor, John Quincy Adams, and Everett among its contributors. From this time on the number of literary periodicals—to say nothing of religious and other special publications—increased rapidly, with a corresponding improvement in quality. The following are perhaps the most noteworthy: *The Analectic Magazine* (Philadelphia, 1813-20), founded by Moses Thomas, with Irving (its editor, 1813-14), Paulding, and Wilson the ornithologist among its contributors; *The Atlantic Magazine* (New York, 1824-25; continued until 1827 as *The New York Monthly Review*), which was edited by Robert C. Sands and had the support of Bryant; *The New York Mirror* (1823-42), of which N. P. Willis was one of the editors; *The Illinois Monthly Magazine* (Vandalia, 1830-32), the first publication of the kind in the West; *The American Monthly Magazine* (New York, 1833-38), edited 1837-38 by Park Benjamin; *Graham's Magazine* (1840-50), a widely and deservedly popular periodical; *The Dial* (Boston, 1840-44), the organ of the New England Transcendentalists, edited by Ripley and Margaret Fuller, and then by Emerson; *The International Magazine* (New York, 1850-52), edited by R. W. Griswold; *The Knickerbocker Magazine* (New York, 1833-60), founded by the novelist Charles Fenno Hoffman, and edited for some time by Louis Gaylord Clark; *Putnam's Monthly Magazine* (New York, 1853-57, and 1867-69); *The Atlantic Monthly* (Boston, 1857—), perhaps the foremost of American periodicals from a literary point of view, having as editors Lowell, Fields, Howells, Aldrich, Scudder, Page, and Perry, and among its contributors Holmes, Longfellow, Whittier, and most of the notable American men of letters; *Harper's New Monthly Magazine* (New York, 1850), an illustrated monthly of high standing and wide popularity; *Scribner's Monthly* (New York), an illustrated monthly founded in 1870 by Dr. J. G. Holland (as editor), Roswell Smith, and Charles Scribner, and from 1881 published, with Richard Watson Gilder as editor, as *The Century Magazine: The Galaxy*, incorporated with the *Atlantic Monthly* in 1878 (New York, 1866—); *Lippincott's Magazine* (Philadelphia, 1868—); *Scribner's Magazine* (New York, 1887—), an illustrated monthly; *The New England Magazine*, illustrated (1889—); *The Cosmopolitan*, illustrated (New York, 1886—); and *McClure's Magazine*, illustrated (New York, 1893—). In the periodicals just mentioned, beginning with *The Atlantic*, the popular literary magazine has reached its highest point of development, not only in the United States, but in the world. Especially important has been the impetus given to developing the art of illustration, and the support given to the obsolescent art of wood-engraving by *The Century* and *Harper's*; it may almost be said that the art was revived by these periodicals.

Of American reviews less need be said. Although some of these are excellent, they do not, as a whole, compare favorably with those that have been published in England and on the Continent. Their history begins with *The American Review of History and Politics* (Philadelphia, 1811-13), a quarterly founded by Robert Walsh. This was soon followed by *The North American Review* (Boston, 1815), which has continued until the present day; among its editors have been many eminent men—A. P. Peabody, H. Adams, Dana, Edward Everett, Sparks, Bowen, Lowell, and Norton. Among later publications of the kind—overlooking those that were merely ephemeral—are: *The Southern Quarterly Review*, first published 1828-32 (Charleston, revived 1842-55); *The United States Magazine and Democratic Review* (New York, 1837-52), later *The United States Review* (1853-55); *The New Englander* (New Haven, 1843-92); *The International Review* (New York, 1874-83); *The Forum* (1886—); *The Arena* (1890—).

Modern French Periodicals. In France the periodicals originating in the eighteenth century begin with *Mémoires pour servir à l'histoire des sciences et des arts* (1701-67), founded by the Jesuits Michel le Tellier and Philippe Lallemant at Trévoux (whence it is known as the *Journal de Trévoux*); it gained a high and well-deserved reputation as a critical authority. In 1703 Jean Leclerc began, in continuation of his *Bibliothèque universelle et historique* (see above), a review entitled *Bibliothèque choisie*, which was issued until 1713 and was followed by his *Bibliothèque ancienne et moderne* (1714-27). These, as well as various other periodicals edited by Frenchmen in this period, were printed in Holland. Among them are to be noted reviews of particular foreign literatures, as the *Bibliothèque anglaise* (1717-19), and the *Mémoires littéraires de la Grande Bretagne* (1720-24) of Michel de la Roche (see above), and the *Bibliothèque germanique* (1720-40) of Jacques Lenfant. About this time the English periodical essay found imitators in France; Marivaux published in 1722 the *Spectateur français*, which was followed by a number of other publications of a similar character. Other literary journals were the *Mémoires secrets de la république des lettres* (1744-48); the *Observations sur les écrits modernes* (1735-43) of Desfontaines; the *Lettres sur quelques écrits de ce temps* (1749-54) and *L'année littéraire* (1754-90) of Fréron; and the *Observations sur la littérature moderne* (1749-52) and *L'observateur littéraire* (1758-61) of the Abbé de la Porte. In 1754 a review, the *Journal étranger*, designed to deal with foreign literature in general, was founded by Fréron, Grimm, Prévost, and others; it ceased to appear in 1762. This was followed by the *Gazette littéraire* (1764-66), in the editing of which Voltaire and Diderot had a hand. The *Mémoires secrets pour servir à l'histoire de la république des lettres* (1762-87), also called *Mémoires de Bachaumont*, from its founder, are an important record of contemporary social and literary conditions; the same is true of the *Correspondance littéraire secrète* (1774-93). Of a more general character were the magazines *Décade philosophique*—later the *Revue philosophique*—(1795-1807), of P. L. Ginguené, the most important French periodical of its time, and the *Magasin encyclopédique*, founded in 1792 and continued from 1817 as the *Annales encyclopédiques* and the *Revue encyclopédique*, until 1832. During the second half of this century appeared a number of periodicals dealing with special subjects, such as agriculture, commerce, political economy, military and naval affairs, and so on. In the early part of the nineteenth century, under both the Empire and the Restoration, the periodical as well as the newspaper press was ham-

periodicals many restrictions and but little progress was made. In 1828 Guizot, Rémusat, and others started the *Revue française*, in imitation of the English reviews; it lived, however, only two years. In 1829 appeared the *Revue de Paris*, which was issued until 1846. The same year (1829) saw the founding of the *Revue des Deux Mondes*, by Ségur-Dupeyron and Mauroy; during 1830 it was not published, but in 1831 it reappeared, and ever since has maintained the high reputation which it at once attained. Pierre Leroux and George Sand started the *Revue Indépendante* in 1841; it ceased to appear in 1848. Many others, equally short-lived, followed it. Among the later literary periodicals are the *Nouvelle Revue* (1879—); *La Livre* (1880—); the *Revue de Paris* (1894—); and the *Revue Britannique* (1825-1901).

Modern German Periodicals. In Germany since the beginning of the eighteenth century development has been mainly in the direction of the learned, and, especially in recent times, of the scientific periodical. An extraordinary number of these have been published, many of them of great value. Literature, however, has also been well represented. Only a few of these journals can be mentioned. One of the earliest and most important was the *Neue Zeitungen von gelehrten Sachen*, founded by J. G. Krause in 1715 and carried on until 1797. "It was the first attempt to apply the form of the weekly political journal to learned subjects." Still more notable is the *Göttingische gelehrte Anzeigen*, founded 1739 as the *Zeitungen von gelehrten Sachen*, and conducted from that time until the present by members of the faculty of the University of Göttingen, among whom have been Haller, Heyne, and Eichhorn. In 1706 the publisher Nicolai founded the *Allgemeine deutsche Bibliothek*, which was issued until 1806. Lessing and Mendelssohn aided in conducting the *Briefe die neueste Litteratur betreffend* (1759-65), also founded by Nicolai. Wieland founded *Der deutsche Merkur* (1773-89; revived 1790-1810). The *Allgemeine Litteraturzeitung*, established by Bertuch in 1785 and issued until 1848, was one of the most important of German literary periodicals; the same may be said of the *Jenaische allgemeine Litteraturzeitung* (1804-84), founded by Eichstädt. The *Wiener Jahrbücher der Litteratur* (1818-48) enjoyed a high reputation, as did, for its learning, *Hermes* (1819-31), founded by W. T. Krug. The *Jahrbücher für wissenschaftliche Kritik* (1827-46), published by Cotta, and the *Heidelberger Jahrbücher der Litteratur* (1808) should also be mentioned. Of more recent date are the *Deutsche Vierteljahrsschrift* (1838-70); *Die Grenzboten* (1841—); *Unsere Zeit* (1857—); *Preussische Jahrbücher* (1858—); *Die Gegenwart* (1872—); the *Litteraturzeitung* (Jena, 1874—); *Deutsche Rundschau* (1874—); *Die Neue Zeit* (1872—); *Nord und Süd* (1878—); *Die Nation* (1888—); *Die Zukunft* (1892—).

Periodicals in Other Countries. The development in other European countries has been similar, though less extensive. Italy, in which, as was stated above, the history of periodical literature dates back to the seventeenth century, exhibits a long list of notable literary journals. Among them are the *Frusta letteraria* (1763-65) of Giuseppe Baretti; the *Novelle letterarie* (1740-70) of Giovanni Lami; the *Biblioteca italiana* (Milan, 1816-40); the *Progresso delle scienze* (Naples, 1832-45); the *Rivista contemporanea* (Turin, 1853—); the *Giornale degli eruditi* (1883—); the *Rivista internazionale* (1869-83); and the *Giornale storico della letteratura italiana* (1883—). Spain and Portugal, Belgium, Holland, the Scandinavian countries, Russia, Greece, and the Slavic countries, are all represented by literary periodicals of prominence.

In all the countries mentioned above, periodicals dealing with theology or the interests and practical work of the various religious denominations; with science, either in general or in one or more of its special branches; with the arts or trades, or with other special themes (including periodicals of humor), multiplied greatly during the nineteenth century. Their history cannot be given here even in the briefest summary.

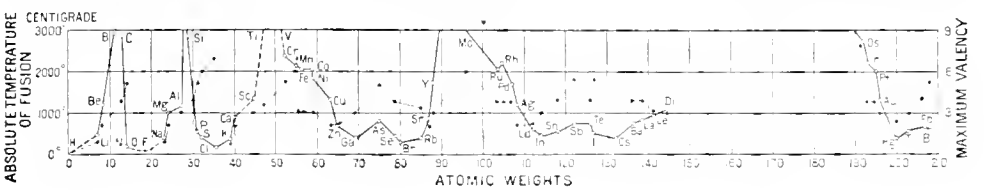
PERIODIC FUNCTION. See Function.

PERIODIC LAW. The generally accepted embodiment of the relations existing between the various properties of the chemical elements, so far as they can be compared with one another. It may be stated as follows: *If the elements are arranged in the order of their atomic weights, each of their properties varies as a periodic function of the atomic weight.*

Ever since the work of Richter, Proust, and Dalton had established the idea of fixed numerical values attaching to the ingredients of compounds, an idea which was deduced by Dalton from the hypothetical existence of individual atoms, identical in size, mass and other properties for any one element, chemists sought to deduce a closer relationship between the various elements from a comparison of the masses of their respective atoms. (See Chemistry and Atomic Weights.) The first attempt was that made by Dr. Prout in 1815 to prove that all the atomic weights were even multiples of the atomic weight of hydrogen, and that the latter was the only primitive element, from which the others were derived by processes of condensation. It was soon found that very few elements possessed atomic weights that could be expressed by integers, when the atomic weight of hydrogen was set at unity, and Prout's law was gradually modified to state that one-half the atomic weight of hydrogen, then that one-quarter, should be taken as the real standard. Refinements of investigation have since established the relative atomic weights to the second place of decimals, and it can now be asserted that the number of exact coincidences with Prout's law, as compared with that of deviations from it, is not much greater than what would be expected by the theory of chances. Prout's law has, therefore, been practically abandoned. On the other hand, interesting relations were found to exist between the atomic weights of similar elements. Thus Dœbereiner established, in 1829, his so-called triads, sets of three closely related elements whose atomic weights were approximately in arithmetical progression, as lithium (7), sodium (23), and potassium (39); calcium (40), strontium (88), and barium (136); sulphur (32), selenium (79), and tellurium (127); chlorine (35.5), bromine (80), and iodine (127); iron (56), nickel (57), and cobalt (58). These triads were later extended to include longer sets, and it was also pointed out that the constant differences were in many cases multiples of 16, the atomic weight of oxygen, whence it was assumed that the heavier elements of a group might

be oxides of the lightest, thus reducing the number of primordial elements considerably. The idea of connecting all the atomic weights in a single progression wherein similar elements recurred at regular intervals seems to have first struck de Chancourtois, and shortly afterwards Newlands; but the law in its complete form is due to Mendeléeff and Lothar Meyer, who reached the same conclusion independently in 1869. As Mendeléeff's exposition was by far the more convincing, he has been given the greater share of the credit.

A good idea of the fundamental principle can be obtained from the accompanying figure, in which the maximum valencies of the elements and their melting-points are shown to be periodically related to the atomic weights. The latter are laid off as abscissas, and the valencies and melting-points as ordinates, on perfectly arbitrary scales. It will be seen that the two curves connecting



the respective points are undulatory, with well-defined maxima and minima, which occur at regular intervals. The curves for most of the other properties which are capable of precise measurement are found to have a similar character; the maxima and minima, of course, do not always coincide with the same elements in one curve as in another, but the elements which occupy similar positions on one curve are also found to be similarly located on another. It is especially noticeable, moreover, that such curves indicate a relationship between the groups of elements, as well as between the elements themselves of each single group. Thus the properties of the alkaline-earth metals are always found to be intermediate between those of the alkalies and those of the aluminum group. Breaks in the continuity of the curves indicate lack of sufficient experimental data.

The arrangement of the elements, as shown in the accompanying table, is the one generally adopted at present, and includes all the well-known elements. An asterisk marks the elements discovered since 1869. Hydrogen occupies a unique position, and is generally omitted from the classification. Argon, helium, neon, and krypton cannot be properly included as yet, because their chemical behavior is still unknown. The vertical columns include the elements most closely associated with one another, and are known as *Groups* I., II., etc.; horizontally we have the *Series* 1, 2, 3, etc., in which the similarities are not great, excepting that a parallelism exists between the elements of one series as compared with those of another. The elements in odd-numbered series bear a closer resemblance to one another than they do to the elements of the intervening even-numbered series, and vice versa, so that it has been found expedient to make two divisions of each group, as will be seen in the table, the odd-numbered series being set to one side, the even-numbered to the other. In the eighth group occur triplets of closely analogous elements to be discussed below. Arrangements into fifteen or more individual groups, in place of the twin and triple groups here shown, have been suggested, but not generally adopted. Mention should also be made of the fact that this table can be constructed by writing the elements in the order of their atomic weights along a screw line of slight pitch upon the surface of a cylinder, and then, as it were, unrolling the cylinder. Various efforts have been made to connect all the atomic weights by a graphic equation, which would provide for an arrangement on some other kind of a spiral curve, either on a plane or in space, but they have been only moderately successful.

Before proceeding with a discussion of the details of the table, it may be well to inquire what significance can be attached to this periodic variability of properties as functions of the atomic weight. The many attempts to connect the atomic masses themselves in arithmetical relations would indicate a widespread opinion that the substances now called elements are really compounds of simpler substances, whose particles have a finite mass and represent individuals of distinct chemical properties, so that the chemical elements in each of the periodic groups might be likened to one of the 'homologous series' of organic compounds. (See, for example, HYDROCARBONS.) This view really antedates the periodic law, but fails in large measure to account for the resemblance existing between adjacent members of different groups. Others, especially Sir William Crookes, have held that the atoms are really fortuitous agglomerates of an indifferent primordial element, and that atoms of approximately the same mass behave similarly because they vibrate similarly, while atoms of greater mass might vibrate harmoniously with the smaller ones. It is difficult to explain, according to this hypothesis of the 'genesis of the elements,' why their number should be as limited as it is. But some facts are known vaguely pointing to the idea that the atoms of elements within the same periodic group are capable of vibrating at harmonically related rates, and that the great majority of chemical and physical properties depend upon atomic vibrations. It may, however, be argued that just as violin-strings may be composed of different materials and yet vibrate together according to common laws, so may the elements be composed of as many individual materials and still exhibit a periodic recurrence of properties, if the latter depend upon the harmonic vibrations of the atoms. Until much additional proof has been brought, the periodic law, while furnishing a vague indication, cannot be taken as positive evidence of the qualitative unity of matter.

In the table it will be found that the first group contains the univalent elements, the second group those which are divalent, and so on up

PERIODIC ARRANGEMENT OF THE ELEMENTS ACCORDING TO INCREASING ATOMIC WEIGHTS

Series	Groups I	II	III	IV	V	VI	VII	VIII		
								a	b	c
1	Hydrogen 1.008									
2	Lithium 7.03	Glucinum 9.1	Boron 11.	Carbon 12.	Nitrogen 14.04	Oxygen 16.	Fluorine 19.			
3	Sodium 23.05	Magnesium 24.3	Aluminum 27.1	Silicon 28.4	Phosphorus 31.	Sulphur 32.07	Chlorine 35.45			
4	Potassium 39.11	Calcium 40.	Scandium* 44.1	Titanium 48.1	Vanadium 51.4	Chromium 52.1	Manganese 55.	Iron, 56.	Nickel, 58.7	Cobalt, 59.	Copper 63.6
5	(Copper) 63.6	Zinc 65.4	Gallium* 69.9	Germanium* 72.5	Arsenic 75.	Selenium 79.2	Bromine 79.95			
6	Rubidium 85.4	Strontium 87.6	Yttrium* 89.	Zirconium 90.4	Columbium 93.7	Molybdenum 96.		Ruthenium, 101.7	Rhodium, 103.	Palladium, 106.4	Silver 107.92
7	(Silver) 107.92	Cadmium 112.4	Indium 113.8	Tin 119.	Antimony 120.4	Tellurium 127.5?	Iodine 126.85				
8	Cæsium 132.9	Barium 137.4	Lanthanum 138.6	Cerium 139.4	Præseodymium* 140.5	Neodymium* 143.6					
9											
10			Erbium 166.3		Tantalum 182.8	Tungsten 184.8		Osmium, 191.	Iridium, 193.1	Platinum, 194.9	Gold 197.2
11	(Gold) 197.2	Mercury 200.	Thallium 204.1	Lead 206.9	Bismuth 208.1						
12				Thorium 232.6	Uranium 239.6						

to the seventh, where the maximum valency is seven. The maximum valency of the elements of the eighth group may be set at eight, but their compounds rarely exhibit so high a valency, and in many other respects this eighth group is rather anomalous and is taken as a transition group between the seventh and the first. Thus the three elements copper, silver, and gold belong, with respect to many of their properties, especially when uncombined, in the eighth group; but their valency is usually low, and many of their salts are so similar to those of sodium that it is often found expedient to place them in the first group, in the positions occupied in the table by their names inclosed in parentheses. These valencies refer especially to the stable oxides. Stable compounds of hydrogen occur only in the fourth, fifth, sixth, and seventh groups, four atoms of hydrogen combining with one of each element of the fourth group, and this amount decreasing until we find the halogens in the seventh group univalent toward hydrogen. The first group includes the most electro-positive elements, and there is a steady transition toward the electro-negative end of the series in the seventh group, while the eighth group shows a rather sudden return toward the electro-positive side. The majority of the compounds derived from elements at the left end of the table are soluble, colorless, and volatile, whereas these properties change from left to right until we find the maximum of insolubility, color, and resistance to heat in the lower right hand of the table. It is also possible to select analogous compounds of the different elements and find those of similar properties fall within a well-marked zone upon the chart. Mendeléeff, in his original essay, added the following: (1) The elements which have the lowest atomic weights are those most widely distributed in nature, and also represent the most typical characteristics found in the second series of the table; (2) the atomic weight determines the character of an element; (3) from a consideration of their position in the system new analogies can be discovered between elements; (4) it may be expected that new elements should be discovered to fill blank spaces within the table, and their properties can be predicted from a consideration of those of the adjacent elements; (5) errors in the assumed atomic weights may be detected through an irregularity in the position of the element in the periodic system.

All of these statements have been verified, and the immediate acceptance of Mendeléeff's views was facilitated especially by the sensational discovery of a number of elements whose properties agreed accurately with those predicted by Mendeléeff. Thus gallium, germanium, and scandium had been completely described with respect to their own properties and those of their compounds before they were actually discovered. Success has also attended the attempts to correct atomic weights in several cases where the elements appeared misplaced in the original tables and were assigned to positions more in accordance with their properties, but necessitating the assignment of new atomic weights. (See ATOMIC WEIGHTS.) The weakest point of the table lies in the position of tellurium, which should fall in the sixth group, but is found to have a higher atomic weight than iodine, which undoubtedly belongs to the same series in the seventh group. Efforts to explain this discrepancy have been so far unavailing. There are also a number of elements derived from the so-called rare earths whose place in the system is not readily assignable. In the latter case, however, it may be said, as well as in that of the atmospheric gases, argon, helium, neon, and krypton, that their properties and atomic weights are not so well established as to cast doubt upon the theory through their failure to coincide with it. One interesting result of the theory is that of limiting the probable number of chemical elements to about 120, since the actual number of blank spaces is limited, and since it is extremely unlikely that any elements remain to be discovered with an atomic weight less than that of hydrogen or greater than that of uranium.

Among the *physical properties* which appear as periodic functions of the atomic weight may be mentioned the densities of the uncombined elements and of their oxides, fusibility, atomic volume, crystalline structure of the compounds, coefficient of expansion, refractive index, conductivity for heat and electricity, color, and velocity as ions.

As an indication of some purely *chemical periodicities* the following conspectus has been arranged, in which the elements are indicated by their positions in the above table, and are generally enumerated in such order that the one which shows the property in the most marked degree has precedence. The maximum valency of the elements toward *oxygen* is indicated throughout by the Roman numeral of each group, omitting the 'peroxides,' in which the oxygen appears to be linked in a different manner.

Maximum valency toward hydrogen in stable volatile compounds:

- Univalent: VII.; 2, 3, 5, 7; powerfully acid hydrogen compounds.
- Divalent: VI.; 2, 3, 5, 7; faintly acid hydrogen compounds.
- Trivalent: V.; 2, 3, 5, 7; basic acid hydrogen compounds.
- Quadrivalent: IV.; 2, 3, 5; neutral acid hydrogen compounds.

Maximum number of hydroxyls in basic compounds:

- One: I.; 1, 2, 3, 6, 8. III.; 11. VIII.; 6 (c and d).
- Two: II.; 2, 4, 6, 8, 3, 5, 7, 11. IV.; 11. VIII.; 4 (bcd).
- Three: III.; 3, 4, 5, 6, 7, 8, 10, 12. V.; 11. VII.; 4. VIII.; 4a.

Minimum valency in oxygen acids:

- One: VII.; 3, 5, 7.
- Three: V.; 2, 3, 5, 7. VI.; 3, 5, 7.
- Four: IV.; 2, 4, 3, 5, 7, 11.
- Five: V.; 4, 6, 10.
- Six: VI.; 4, 6, 10. VII.; 4. VIII.; 4a.

Tendency to liberate hydrogen from water below red heat:

I.; 2, 3, 4, 6, 8. II.; 2, 3, 4, 6, 8. VIII.; 4a.

Tendency to liberate oxygen from water:

VII.; 2, 3, 5.

Elements whose chlorides are unstable toward water:

V.; 3, 5, 7, 11, 4, 6, 10, 12. VI.; 10, 6, 4.

Elements whose sulphides can be precipitated from dilute acid solution:

VIII.; 4d, 6 (abcd), 10 (abcd). II.; 11, 7. III.; 11, 7. IV.; 11, 7, 5. V.; 11, 7, 5. VI.; 12, 10, 6.

[illegible] form alums with the sulphates of I., [illegible]
[illegible] 2, 4, 6, 10. VI.: 4. VII.: 4. VIII.: 4a.
[illegible] to form volatile compounds with organic radicles:

With one methyl group: I.: 3. vii.: 2, 3, 5, 7.

With two methyl groups: II.: 3, 5, 7, 11. VI.: 2, 3, 5, 7.

With three methyl groups: III.: 2, 3, 5, 7, 11. V.: 2, 3, 5, 7, 11.

With four methyl groups: IV.: 2, 3, 5, 7, 11.

Ability to form complex bases with ammonia: VIII.: 4 (ed), 6 (abed), 10 (abed). VI.: 4. II.: 3, 11.

Consult: Newlands, *On the Discovery of the Periodic Law and on Relations Among the Atomic Weights* (London, 1884); Huth, *Das periodische Gesetz der Atomgewichte und das natürliche System der Elemente* (Frankfurt a. O., 1884); Bebr, *Das periodische Gesetz und das natürliche System der Elemente* (Laibach, 1897); Mendeléeff, "The Principles of Chemistry," in *A Library of Universal Literature* (New York, 1901); Venable, *A Bibliography of the Periodic Law* (Easton, Pa., 1896).

PER'IŒ'CI (Lat., from Gk. Περίοικοι, *Perioikoi*, dwellers round, i.e. round about some particular locality or city, from περιοικεῖν, *perioikein*, to dwell around, from περί, *peri*, around + οἰκεῖν, *oikein*, to dwell, from οἶκος, *oikos*, house). The subject population of Laconia and the Spartan territory. They were not slaves like the Helots (q.v.), and seem to have been allowed to govern their own towns, under Spartan oversight; but they could hold none of the higher offices of State, had no share in the general government, and, we are told, could be put to death by the ephors without a trial. They paid a contribution to the kings, but otherwise seem to have been only taxed, like the Spartans, in time of war. As the choicest lands belonged to Spartans, the Perioeci seem to have devoted themselves largely to manufacture and trade, which were forbidden to the Spartans. Their work in metal, especially armor, wood, and leather, was celebrated and found a ready sale in foreign parts, and their coast towns seem to have enjoyed a flourishing commerce. Their numbers must have been considerable, even though the hundred cities of Strabo were probably most of them of no great size. They were always more numerous than their superiors, the Spartans, and this disparity increased greatly during the fourth century B.C.; but, though chafing under their inferiority, the Perioeci remained loyal till the Theban invasion after the battle of Leuctra (B.C. 371), when many of them joined the victors. They were evidently trusted by the Spartans, for they not only served as light-armed troops, but formed no small part of the heavy-armed forces, while the Spartan fleet must have been almost wholly dependent upon them, and in some cases we find one of their number in command of a squadron or an allied fleet. As the acquisition of the Spartan territory was a gradual conquest, it is not likely that all the Perioeci had the same position. It may also be regarded as certain that while there may have been an Achæan element in some communities, the bulk of the Perioeci were Dorian. They are called Lacedæmonians, but not Spartans.

PER'IOS'TEUM (Neo-Lat., from Lat. *periostion*, from Gk. περιόστεος, *periosteos*, surrounding the bones, from περί, *peri*, around + ὀστέον, *osteon*, bone). A tough fibrous membrane which surrounds each bone. It is highly vascular, and is the means by which the outer layers of the shafts and the greater part of the spongy portions of the bones are supplied with blood. It consists of an outer or fibrous layer and an inner or osteogenetic layer. The inner layer is very vascular and contains many protoplasmic cells called *osteoblasts*. Numerous experiments show that the formation of bone is essentially due to the action of the periosteum; and that, by transplanting detached portions of periosteum into muscular or other tissues, bony tissue is generated in those parts. In most cases in which this membrane has become detached in consequence of a wound or of disease, the exposed bone (except in the instance of the skull, which derives most of its nutrient matter from the dura mater, which is really the periosteum of the inner surface of the skull) perishes; but this is not invariably the case. Among its other offices, it serves, by isolating the bone from the surrounding tissues, to prevent the spread of disease from them to it. The shin-bone, or tibia, is thus indebted to the periosteum for its ordinary immunity in cases of ulcer in that region.

PER'IOSTI'TIS (Neo-Lat., from *periosteum*). An inflammation of the periosteum (q.v.). It occurs generally on the surface of thinly covered bones, such as the tibia, clavicle, or cranial bones. It may be caused by injury, and is part of acute osteomyelitis (q.v.); and like this disease, it is often brought on in boys and young men by bathing in cold water after violent exercise, or by similar forms of exposure. When the affection is caused by syphilis, oval swellings called nodes (q.v.) are produced, and there is considerable nocturnal pain. Rheumatism and tuberculosis are also causes. The acute form of periostitis must be treated with poultices and antiphlogistic remedies, and opiates given to relieve the severe pain. Severe cases must be incised freely in order to relieve pressure and allow of drainage if pus has formed. The treatment of the chronic forms of this affection must be mainly directed to the diseases which originated them.

PERIPATETIC PHILOSOPHY (Lat. *peripateticus*, from Gk. περιπατητικός, *peripatētikos*, given to walking about, from περιπατεῖν, *peripatein*, to walk about, from περί, *peri*, around + πατεῖν, *patein*, to walk, from πάτος, *patos*, path). A name applied to the philosophy of the school of Aristotle, derived, according to some, from the name of the building in which Aristotle lectured. As a school, the Peripatetics had comparatively little interest in metaphysical problems, and spent most of their effort on the study of nature and on an attempt to popularize the study of ethics. Some of them modified to a great extent the teaching of Aristotle, chiefly in a naturalistic direction. The later members of the school were in general faithful to his teachings, and derived much of their importance from their careful work in the arrangement and explanation of his writings. The two most prominent leaders, after Aristotle's death, were Theophrastus of Lesbos and Eudemus of Rhodes, who developed his syllogistic methods of reasoning, and in the main did little more than supplement his work. Theophrastus was suc-

ceeded as head of the school in B.C. 288 or 287 by Strato of Lampsacus, who held the position for eighteen years, and whose teaching was in the direction of a consistent naturalism. Andronicus of Rhodes, about 70 B.C., did much for the study of Aristotle; and to him is probably due the received arrangement of his works, beginning with the Logic as a necessary foundation. The Peripatetics of the period following this, while they did much for exegesis, showed a leaning toward Stoicism, and by their eclectic tendency prepared the way for the combination of various systems characteristic of Neo-Platonism.

PERIP'ATUS (Neo-Lat., from Gk. *περίπατος*, a walking around, from *περιπατεῖν*, *peripatein*, to walk around). This strange creature stands alone, with no animals intermediate between itself and the worms on the one hand, and the true Arthropoda on the other. Originally supposed to be a worm, it is now referred to a class by itself, the Malacopoda of Blainville, or Protracheata of Haeckel. It lives in the tropics, in damp places under decaying wood. In general appearance it somewhat resembles a caterpillar, but the head is soft and worm-like, though it bears a pair of antenna-like tentacles. It may be said rather to resemble superficially a leech with clawed legs, the skin and its wrinkles being like those of a leech. There is a pair of horny jaws in the mouth, but these are more like the pharyngeal teeth of worms than the jaws of arthropods. The numerous legs end each in a pair of claws. The ladder-like nervous system is unlike that of annelid worms or arthropods, but rather recalls that of certain mollusks, as well as that of certain flatworms and nemertine

PERIPATUS.

worms. Its annelid features are the large number of segmentally arranged true nephridia, and the nature of the integument. Its arthropodan features, which appear to take it out of the group of worms, are the presence of tracheæ, of true salivary and slime glands, of a pair of coxal glands, as well as of claws at the end of the legs. The heart is arthropodan, being a dorsal tube lying in a pericardial sinus with many openings. This assemblage of characters is not to be found in any marine or terrestrial worm.

The tracheæ are fine unbranched tubes, without a spiral thread, and are arranged in tufts, in *Peripatus Edwardsii*, opening by simple orifices or pores (stigmata), scattered irregularly over the surface of the body; but in another species (*Peripatus Capensis*) some of the stigmata are arranged more definitely in longitudinal rows on each side, two dorsally and one ventrally. The stigmata in a longitudinal row are, however, more numerous than the pairs of legs.

The salivary glands, opening by a short common duct into the under side of the mouth, in the same general position as in insects, are evidently, as the embryology of the animal proves, transformed nephridia, and, being of the arthropodan type, explain the origin and morphology of those of insects. It is so with the slime glands, these, with the coxal glands, being transformed and very large dermal glands. Those of insects arose in the same manner, and are evidently their homologues, while those of Peripatus were probably originally derived from the setiparous glands in the appendages (parapodia) of annelid worms.

The genital glands and ducts are paired, but it is to be observed that the outlets are single and situated at the end of the body. In the male the ejaculatory duct is single; in its base a spermatophore is found. It will be seen, then, that Peripatus is not only a composite type, and a connecting link between worms and tracheate arthropods, but that it may reasonably be regarded, if not itself the ancestor, as resembling the probable progenitor of chilopods, myriapods, and insects, though of course there is a very wide gap between Peripatus and the other antennate, air-breathing Arthropoda.

Consult: Moseley, "On the Structure and Development of Peripatus Capensis," in *Philosophical Transactions of the Royal Society* (London, 1874); A. Sedgwick, "The Development of Peripatus Capensis," parts i., ii., iii., in *Quarterly Journal of Microscopical Science* (London, 1885-87); Packard, *Text-Book of Entomology* (New York, 1898).

PER'IPLUS (Lat., from Gk. *περίπλοος*, *periploos*, *περίπλους*, *periplous*, voyage round, from *περίπλειν*, *periplein*, to sail round, from *περί*, *peri*, around + *πλεῖν*, *plein*, to sail). A name for various ancient maritime itineraries, as that of Hanno (q.v.).

PERIPNEUMONIA (Neo-Lat., from Gk. *περιπνευμονία*, inflammation of the lungs). An old term for pneumonia (q.v.).

PERIP'TERAL (from Lat. *peripteros*, from Gk. *περίπτερος*, with a single row of columns around, from *περί*, *peri*, around + *πτερόν*, *pteron*, wing, row of columns). A term applied to temples or like buildings entirely encircled by a row of free-standing columns. The Greek temples were nearly always peripteral, while the Roman temples were not.

PERISPERM (from Gk. *περί*, *peri*, around + *σπέρμα*, *sperma*, seed). The nutritive tissue in seeds outside of the embryo-sac. It is derived from the tissue of the nucellus which has not been destroyed by the encroachment of the sac. The ordinary nutritive tissue of seeds is developed within the embryo-sac, and is known as 'endosperm.' See SEED.

PERISSODAC'TYLA (Neo-Lat. nom. pl., from MGk. *περισσοδάκτυλος*, *perissodaktylos*, having an odd number of toes, from Gk. *περισσός*, *perissos*, beyond the regular number or size, odd + *δάκτυλος*, *daktylos*, finger, toe). A suborder of the Ungulata, containing all those forms which have an odd number of toes, as distinguished from the even-toed ungulates, Artiodactyla. The third digit is always the largest and sometimes the only functional one. The carpal, metacarpal, tarsal, and metatarsal bones are correspondingly modified. The stomach is simple and non-ruminant. In all living forms the horns, if present, are median and not lateral. Many fossil forms are known, but the living species are comparatively few, and are naturally and easily grouped in three families—the tapirs, rhinoceroses, and horses. See UNGULATA.

PERISTALTIC MOTION (from Gk. *περισταλτικός*, *peristaltikos*, compressive, from *περιστέλλειν*,

peristaltic, to wrap around, from περι, *peri*, around + στελλειν, *stellein*, to place, to compress). The terms *peristaltic* and *vermicular* are applied to the peculiar wave-like motion or action of the stomach and intestines by which the food is regularly moved onward. Peristalsis takes place from one end of the intestinal tract to the other, but it is seen at its best in the small intestine. Peristaltic movements are effected by the alternate contraction and dilatation of successive portions of the muscular coats. These coats are two in number, an external longitudinal and an internal circular layer of fibres, under the control of the sympathetic nervous system through the agency of the *ganglionic plexus* situated in the intestinal walls. In peristalsis the longitudinal fibres contract first, and draw the intestine backward over the substance to be propelled, shortening and dilating the tube at this point, while the circular fibres of the same part contract in succession from above downward, forcing the substance into the next portion of the intestine, where the same process is repeated.

Under ordinary circumstances peristalsis gives rise to no sensation, the presence of food being just sufficient stimulus for a gentle and normal action. In the presence of irritating substances, however, peristalsis becomes painful, violent, and spasmodic. When the intestinal canal is empty there is probably little or no movement. See DIGESTION.

PERISTOME (from Gk. περι, *peri*, around + στοα, *stoma*, mouth). The fringe of teeth around the mouth of a moss capsule. See MUSCI.

PERISTYLE (from Lat. *peristylum*, Gk. περιστυλον, *peristylon*, a building with columns around). In architecture, a line of columns about a building or a court.

PERIT, PLATIAH (1785-1864). An American merchant and philanthropist, born in Norwich, Conn., of Huguenot ancestry, and educated at Yale College, where he graduated in 1802. After acting as a clerk in a Philadelphia importing house (1805-09), he went to New York City, where he entered the firm of Goodhue & Co., shipping merchants, in 1817. From 1853 to 1863 he was president of the Chamber of Commerce, and in the latter year retired from business. Perit was prominent in many charities, especially in behalf of seamen, as a member of various boards of the Presbyterian Church, and as an officer of the American Bible Society. In 1857, during the war between the New York 'municipal' and 'metropolitan' police, he was police commissioner and did much to restore order. His projected history of American commerce, begun after his retirement from business, was not completed.

PERITONE'UM (Lat. *peritonæum*, *peritonæum*, from Gk. περιτόναιον, *peritonaion*, neu. sg. of περιτόναιος, *peritonaios*, stretched around, from περιτείνειν, *periteinein*, to stretch around, from περί, *peri*, around + τείνειν, *teinein*, to stretch). A serous membrane which more or less completely invests all the viscera lying in the abdominal and pelvic cavities, and is then reflected upon the walls of the abdomen, so that there is a visceral and a parietal layer. Numerous folds are formed by the visceral layer as it passes from one organ to another. They serve to hold the parts in position, and at the same time inclose vessels and nerves. Some of these folds are termed *ligaments*, from their serving to support the organs. Thus we have ligaments of the liver, spleen, bladder, and uterus formed by peritoneal folds. Others are termed *mesenteries*, and connect the intestines with the vertebral column. They are the mesentery proper (q.v.), which has been already described, the ascending, transverse, and descending meso-colon, and the meso-rectum. Lastly, there are folds called *omenta*, which proceed from one viscus to another. They are three in number—viz. the *lesser* or *gastro-hepatic omentum*, which extends from the under surface of the liver to the lesser eurvature of the stomach; the *gastro-splenic omentum;* and the *great* (or *gastro-colic*) *omentum*, which consists of four layers of peritoneum, the two which descend from the stomach, and the same two returning upon themselves, and ascending as high as the transverse colon, where they separate, and inclose that organ. These separate layers may be easily seen in the young subject, but in the adult they are more or less blended. The great omentum always contains some adipose tissue, which in corpulent persons often accumulates to an enormous extent. Its use appears to be (1) to protect the intestines from cold and from injury by covering them anteriorly as with an apron, and (2) to facilitate their movement upon each other during their vermicular action. In the female the peritoneal cavity is not completely closed, as the Fallopian tubes open into it by their free extremities. Inflammation of the peritoneum is termed peritonitis (q.v.).

PERITONI'TIS (Neo-Lat., from Lat. *peritonæum*, *peritonæum*, peritoneum). An inflammation of the peritoneum (q.v.).

Peritonitis may be acute or chronic, primary or secondary. Primary or idiopathic inflammation of the peritoneum occurs after exposure to cold or wet, and is sometimes known as rheumatic peritonitis. Its rarity is rather remarkable, considering how frequently the pleura, pericardium, and similar structures are affected. Secondary peritonitis is due to an extension of inflammation from or perforation of one of the abdominal viscera. By extension it may follow an inflammation of the stomach or intestines, or extensive ulcerations of these parts, abscess of any of the solid organs, or of the retroperitoneal tissues. Perforative peritonitis commonly arises from penetrating wounds, or ulcer of the stomach or bowels. An important cause is perforating appendicitis, which is responsible more often than any other single cause, and especially in young adult males. A more liberal blood supply renders the appendix of the female less liable to damage, but, on the other hand, the generative organs are a frequent means of introducing an infection into the peritoneal cavity.

Acute peritonitis generally presents well-marked symptoms. It commences with a chill, or severe pain in the abdomen may be the first symptom. The pain is at first confined to particular spots (usually in the lower part of the abdomen), but it soon extends over the whole abdominal region. It is increased, on pressure, to such an extent that the patient cannot even bear the weight of the bedclothes; and to avoid, as far as possible, internal pressure upon the peritoneum, he lies perfectly still, on his back, with the legs drawn up, and breathes by means of the ribs, in consequence of the pain occasioned by the descent of

the diaphragm in inspiration. The breathing is shallow, and, less air being admitted at each movement of respiration, the number of those movements is increased. There are 40 or even 60 respirations a minute, instead of 18 or 20. The pulse is very frequent, often 120 or more in the minute, and small and tense, though occasionally strong and full at the commencement of the attack. The temperature may rise rapidly after the chill to 104° or 105°, but is subsequently lower. Some very severe cases have no fever throughout the attack. Vomiting is an early and prominent symptom and causes great pain. After the disease has continued for a certain time, the belly becomes tense and swollen, the enlargement being caused at first by flatus, and afterwards also by the effusion of fluid.

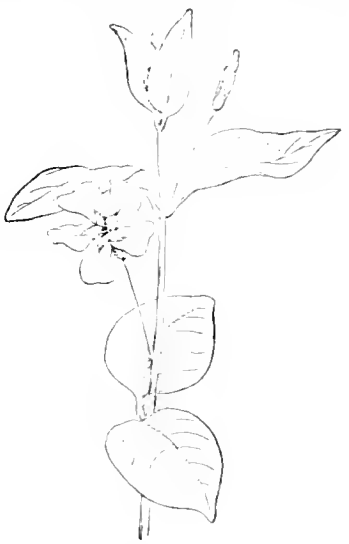
The appearance of the patient when at the height of the disease is very characteristic. The 'Hippocratic countenance' is more often observed in peritonitis than in any other disease except cholera—"a sharp nose, hollow eyes, collapsed temples; the ears cold, contracted, and their lobes turned out; the skin about the forehead being rough, distended, and parched; the color of the whole face being brown, black, livid, or lead-colored." Acute diffuse peritonitis is usually fatal in from two to ten days. Often death occurs with great suddenness, due to cardiac paralysis.

Chronic peritonitis may result from an attack of the acute form, producing adhesions, either local or general, between the peritoneal surfaces. The intestines may be matted together or compressed at particular points by fibrous bands. Often there are no symptoms, but if the intestine is constricted colicky pains will be felt. Tuberculosis may cause either acute or chronic peritonitis, but usually the latter. It occurs at all ages and presents symptoms of extraordinary complexity and diversity. Sometimes the condition is discovered by accident, during an operation for some other trouble. Caseous masses form, the mesenteric glands are enlarged, and the omentum is irregularly thickened. These masses can be felt through the abdominal walls. Cancerous peritonitis is usually an extension from some other organ.

The treatment of acute peritonitis must be prompt, vigorous, and persistent. In the earliest stage it may be aborted or limited by the use of ice bags locally, and a saline or calomel purge. Complete rest is demanded at all stages of the disease. The intestinal movements may be quieted and pain allayed by the administration of opium, and in the height of the disease this is the only drug worth considering. Tolerance to opium in peritoneal inflammation is great, and comparatively large doses must be given. When due to perforation, as in appendicitis, prompt operation will often prevent the spread of the infection. Tubercular peritonitis is often cured by simply opening the abdomen, exposing the tuberculous masses to the air, and flushing out the cavity with saline or antiseptic solutions. General treatment is unsatisfactory, but fresh air, tonics, cod-liver oil, and creosote may effect a cure.

PER'ITYPHLI'TIS (*Neo*-Lat., from Gk. *περί*, *peri*, around + *τυφλός*, *typhlos*, blind, with allusion to the cæcum). An inflammation of the peritoneal covering and the loose connective tissue attaching the cæcum and ascending colon to the iliac fascia. Formerly what is now known as appendicitis was thought to be due to inflammation of the cæcum, or typhlitis, and of the peritoneum covering it, or perityphlitis; but these conditions are now believed to exist independently of appendicitis only in exceptional cases. See CÆCUM; COLON; VERMIFORM APPENDIX.

PERIWINKLE (AS. *pervinca*, *pervince*, *perwinke*, from Lat. *pervinca*, periwinkle, from *per*, through + *vinca*, twist, from *vincire*, to bind), *Vinca*. A genus of plants of the natural order Apocynaceæ, having a five-cleft calyx and a salver-shaped corolla, bearded at the throat, with five obliquely truncated segments, opposite evergreen leaves, and flowers which grow singly or in pairs from the axils of the leaves. The lesser periwinkle (*Vinca minor*), growing in woods and thickets of Europe, is a half-shrubby plant with trailing stems, which root at their extremities, ovate-lanceolate leaves, and pale blue or sometimes white or reddish-purple flowers. The



GREATER PERIWINKLE.

greater periwinkle (*Vinca major*), which has much larger flowers and ovate-cordate ciliated leaves, is a native of the south of Europe. These species are commonly planted in shrubberies and gardens because they rapidly cover unsightly objects with pleasing green foliage, and produce beautiful flowers at almost all seasons of the year, even in mild winters. They have escaped in the United States. The former is very commonly found and the latter, which is less hardy, occasionally. The herbaceous periwinkle (*Vinca herbacea*), an Hungarian species, is remarkable for the abundance of its flowers. The rose-colored periwinkle (*Vinca rosea*), a native of Madagascar, is a favorite greenhouse plant.

PERIWINKLE. A small gastropod mollusk of the genus Littorina, characterized by the shell being top-shaped, solid, the columella thickened, the lip of the aperture simple, not toothed, and the round aperture closed by a horny operculum. The animal has long tentacles, with an eye at the base of each tentacle. Periwinkles

[illegible] or are ovoviviparous. They [illegible] vast numbers on the rocky shores of the North Atlantic between tide marks, and especially near low water mark. They feed on seaweeds. Our two native species are *Littorina rudis*, rather elongated with a high spire, and *Littorina palliata*, which has a low spire, with

AMERICAN PERIWINKLES.

1 *Littorina rudis*. 2. *Littorina littorea*. 3. *Littorina palliata*.

the body-whirl rather swollen. The latter varies greatly in color from pure olive green to yellow or even bright red, with revolving black lines, the colors more or less simulating that of the seaweeds among which it lives.

A much larger species, and now more abundant on the coast north of New York than any other, is *Littorina littorea*, which in 1857 was introduced from Europe into Nova Scotia and now abounds in vast numbers all along the coast. It lives nearer low tide than the native species, and frequents exposed rocks not covered by seaweeds. It is a much larger and heavier shell than the others, and varies much in the height of the spire. Bumpus has shown that since its introduction into America, where it has been subjected to a new environment, this shell differs from those of England in being more elongated, lighter in weight, more bulky, while the color-markings are less pronounced. It also appears that there are already many local races on the New England coast. These mollusks are able to live for days and even weeks out of the sea, in one case four months. The power of resisting dryness seems to be still greater with tropical species. In Jamaica *Littorina muricata* lives among grass and herbage at the top of low cliffs. At Panama three large species were found on trees at and above high-water mark. The eggs of those Littorinæ which are not ovoviviparous are deposited on seaweeds, rocks, etc., enveloped in a glairy mass just firm enough to retain its shape.

The name 'periwinkle' is given popularly to almost any small spiral shell, especially along the shores of the Great Lakes to the turret-shaped pulmonates of the genus Melania. In the shortened form 'winkle' it is applied by the oystermen in the neighborhood of New York to the conchs (Fulgur) which feed upon the oyster beds.

PERJURY (Lat. *perjurium*, false oath, from *perjurus*, one who swears falsely, from *perjurare*, to swear falsely, from *per*, through + *jurare*, to swear, from *jus*, right, law). The crime of knowingly and willfully giving false testimony, which is material to the questions in issue in a judicial proceeding. The offense is committed whether the testimony is given under an oath or affirmation, provided either is administered by a competent authority. If a witness makes a misstatement through inadvertence or mistake he is not guilty of the crime. If he recklessly and knowingly makes a statement as to the truth or falsity of which he has no knowledge, it has been held to constitute perjury. A witness may be convicted of perjury under such circumstances even though the facts he testifies to subsequently prove to be true. It is not essential to constitute the offense that the testimony be believed, or that it cause a perversion of justice in the cause in which it is given. Where a witness honestly states his opinion as to a fact, if it is not correct, he is not liable; but if the fact is material to the issue, and he makes a willfully false statement as to it, he is guilty of perjury.

In most jurisdictions a voluntary oath, taken outside a judicial proceeding, cannot be made the basis of a charge of perjury, as the law does not punish criminally prevarication in private matters. An exception to this exists under the laws of the United States. See OATH.

At the early common law the testimony of two witnesses was necessary to convict a witness of perjury. However, to-day in most jurisdictions the testimony of one witness and proof of corroborating circumstances is sufficient, if credible.

Perjury has always been severely punished, as it tends to the perversion and obstruction of justice. In ancient times in England the penalty was death; subsequently banishment or cutting out the tongue; after the Norman era, forfeiture of goods and imprisonment; and at present in England and the United States it is punished by fine or imprisonment, or both. In a few States a person so convicted is thereafter incompetent to give testimony in judicial proceedings.

Subornation of perjury consists in inciting or procuring another to commit perjury. The witness must have actually committed perjury in order to render the person who incited him to do so guilty of the crime. An attorney calling a witness who he believes will not tell the truth does not thereby become liable if the witness does in fact commit perjury, if he did not actually connive at it, or solicit him to do so. Subornation of perjury is usually punished with as much severity as perjury itself. See OATH; WITNESS. Consult the authorities referred to under CRIMINAL LAW and EVIDENCE.

PER'KINS, CHARLES CALLAHAN (1822-86). An American art-historian, born in Boston. After graduating from Harvard he lived for a time in Rome, then studied painting in Paris under Ary Scheffer, and on a subsequent visit in 1865 took up etching under Bracquemont and Lalaime. He was one of the founders and honorary director of the Boston Museum of Fine Arts, and in 1868 became a corresponding member of the French Institute. He also cultivated music, was president of the Handel and Haydn Society in 1870-83, and occasionally conducted its performances. Through his writings and lectures he contributed much to the promotion of art in this country, and enjoyed wide reputation as a critic. He published: *Tuscan Sculptors* (1864), *Italian Sculptors* (1868), both with etchings by the author; *Art in Education* (1870); *Raphael and Michelangelo* (1878), a biographical and critical essay; *Sepulchral Monuments in Italy* (1883); and *Ghiberti et son école* (1885). *The Historical Handbook of Italian Sculpture* (1883) is practically a new edition of *Tuscan Sculptors* and *Italian Sculptors*. He was also critical editor of the *Cyclopædia of Painters and Painting*, edited by Champlin (1885-87).

PERKINS, ELISHA (1741-99). An American physician, born in Norwich, Conn. He is chiefly known for the invention in 1796 of Perkins's

metallic tractors, pins or bars of iron and brass, supposed to possess curative virtues, which were drawn in a certain way over the affected parts in rheumatism, gout, neuralgia, and local inflammations. This method of treatment was called Perkinism and for a time it enjoyed a certain vogue both in Europe and America. Perkins afterwards invented a medicine for fevers, whose efficacy he undertook to prove during the yellow-fever epidemic in New York in 1799, but he himself fell a victim to the disease.

PERKINS, Frederic Beecher (1828-99). An American librarian and author, born at Hartford, Conn. He left Yale before graduation to study law, and was admitted to the bar in 1851. For three years he was associate editor of *Barnard's American Journal of Education*. After some experience as secretary of the Boston Public Library, he was librarian of the free library at San Francisco from 1880 to 1887. His publications include: *Scrope, or the Lost Library*, a novel (1874); *Check List of American Local History* (1876); *Devil Puzzlers, and Other Studies* (1877); *My Three Conversations with Miss Chester* (1877); and a *Life of Dickens* (1877).

PERKINS, George Henry (1844—). An American naturalist, born at Cambridge, Mass. He was educated at the Knox Academy, Galesburg, Ill., and at Yale (1867). In 1869 he was appointed professor of natural history in the University of Vermont, and in 1898 dean of the natural science department. He served as State entomologist from 1880 until 1895, when he was made State geologist. His publications include State reports *On the Injurious Insects of Vermont* (3 vols., 1876-78); *Parasites Infesting Man and the Lower Animals* (1880); *The Flora of Vermont* (1888); and *The Marble, Slate, and Granite Industries of Vermont* (1898).

PERKINS, Jacob (1766-1849). An American inventor, born at Newburyport, Mass. While still a boy serving his apprenticeship to a goldsmith, he invented a process of plating shoebuckles. In 1787 the Massachusetts State Government engaged him to cut dies for its mint. Later he improved bank-note engraving by substituting steel plates for copper, and in 1800 he invented a machine by which nails could be cut and headed at the same time. When 52 years of age, he went to London, where he secured remunerative contracts. He supplied plates to the Bank of Ireland, built steam-engines, and completed a number of inventions, among which were a process for transferring engravings from one steel plate to another; the pleometer, an instrument to measure the speed of ships; the bathometer, an instrument to measure the depth of water; and a rapid firing gun, which could discharge nearly 1,000 rounds per minute.

PERKINS, James Breck (1847—). An American historian and politician, born at Saint Croix, Wis. He graduated at the University of Rochester in 1867, was City Attorney there from 1874 to 1878, and became a member of the New York Assembly in 1898, and of the United States House of Representatives in 1901. His publications include: *France Under Richelieu and Mazarin* (1887); *France Under the Regency* (1892); *France Under Louis XV.* (1897); and *Richelieu* (1900), in the "Heroes of the Nations" series.

PERKINS, Justin (1805-69). An American missionary. He was born at West Springfield, Mass.; graduated at Amherst College in 1829; studied theology at Andover; embarked at Boston, 1833, as a missionary of the American Board; and established the Nestorian mission at Urumiah, Persia, in 1834. He was joined by Dr. Asahel Grant (q.v.) in 1835. In 1842 he visited the United States, accompanied by Mar Yohannan, the Nestorian bishop. Besides a translation of the Bible into modern Syriac (2 vols., 1846-52), and commentaries on Genesis and Daniel (1869), Dr. Perkins published *Eight Years in Persia* (1843); *Missionary Life in Persia* (1861).

PERKINS, Thomas Handasyd (1764-1854). An American merchant and philanthropist; born in Boston. In 1785 he entered into partnership with his brother James in Santo Domingo, and was later representative of the firm in the United States. In 1789 he went to Batavia and Canton, to familiarize himself with the Chinese and East Indian trade, and after his return settled in Boston, where he became very successful. He was one of the originators of the Quincy Railroad, the first in the United States, founded the Perkins Asylum for the Blind, contributed liberally toward the erecting of the Bunker Hill Monument, and was one of the chief benefactors of the Boston Athenæum and the Massachusetts General Hospital. Consult Cary, *Memoirs of Thomas Handasyd Perkins* (Boston, 1856).

PER'KIN WAR'BECK. A pretender to the throne in the reign of Henry VII. of England. See Warbeck, Perkin.

PERKIN WARBECK, The Chronicle History of. A tragedy by John Ford (1634), on the career of the pretender of that name, and the most faultless of Ford's plays. The source was probably Bacon's *Life of Henry VII.*

PERKNITE (from Gk. *περκνός, perknos*, dark; connected with Skt. *piśan*, spotted). An igneous rock of granitic texture, composed essentially of augite or hornblende. The term is applied rather to a family of rocks than to an individual species. Perknites are rich in lime and magnesia and low in silica, alumina, and the alkalies. They have generally been included under the family name pyroxenite (q.v.), which has a wider scope of meaning, and includes magnesian as well as lime-magnesian rocks.

PERLES, pĕr'lĕs, Joseph (1835-94). A German rabbi and Orientalist. He was born at Baja, in Southern Hungary, and studied there and at Breslau, where he graduated, having already contributed to the *Monatsschrift für Geschichte und Wissenschaft des Judenthums*, a valuable thesis, "Meletemata Peschitthoniana" (1859). This monograph advanced the theory that the Peshitto version, though preserved only by the Christian Church, is Jewish in tone and influence. In 1862 he became rabbi at Posen, whence he went to Munich in 1871. Besides the dissertation already mentioned, Perles published valuable papers on the history of the Jews during the Middle Ages, and on Hebrew etymology and philology.

PERM, pĕrm. A government of Eastern Russia, bounded by the Government of Vologda on the north, Tobolsk on the east, Orenburg and Ufa on the south, and Vyatka on the west (Map: Russia, J 3). Area, about 128,300 square miles. While politically a government of European Russia, geographically Perm belongs partly to Asia. The centre of the region is occupied by the Ural

Mountains [illegible] which traverse the district from north to south. They hardly exceed 5000 feet in their highest points. The eastern part of the government is lower than the western. (For geology, see PERMIAN SYSTEM.) Perm is watered by the Kama, Petchora, and Sosva, with their tributaries. The largest of these streams are navigable.

The climate is continental and harsh, especially in the mountainous districts of the centre. In regard to its mineral deposits Perm exceeds every other government of European Russia. The chief minerals are gold, silver, iron, copper, platinum, nickel, zinc, coal, and salt. Precious stones, such as sapphires, jacinths, topazes, and many others, are also found in considerable quantities. The mining of iron and copper employs over 190,000 persons. The value of the annual output is estimated at over $28,000,000. The annual output of gold exceeds $2,500,000, while the output of coal is as yet slight.

Agriculture is carried on all over the district, but only in the black-soil region of the south is the supply equal to the demand. Stock-raising is especially developed among the Bashkirs. Perm has extensive forests which cover over 80 per cent. of the total area. Lumbering and shipbuilding are carried on to some extent. The house industry is favored by the abundance of natural resources. The products of that industry include hardware, pottery, wooden articles, yarns, coarse cloth, ropes, trunks, etc. The manufacturing industries are chiefly in connection with the mineral industries, namely, the manufacturing of steel, iron, etc. The fairs of Irbit (q.v.) are of considerable importance in the trade with the eastern possessions of Russia, but since the construction of the Trans-Siberian Railway the commerce has fallen off to a perceptible extent. Population, in 1897, 3,003,208, including a considerable number of Bashkirs, Permiaks, Tatars, Tcheremisses, and Voguls. The exploitation of the mining resources of the region was begun by the Stroganoffs in the sixteenth century. Capital, Perm.

PERM. The capital of the government of the same name in Eastern Russia, on the Kama, 300 miles northeast of Kazan (Map: Russia, J 3). It is regularly laid out; the houses are mostly of wood. Its educational institutions comprise two gymnasia, a realschule, a museum, a meteorological station, and a number of scientific societies. There are several machine works, tanneries, etc., and the port carries on an extensive transit trade during the navigable season. Population, in 1897, 45,403. The town was founded on the site of a mining settlement in 1781.

PERMANGANIC ACID. See MANGANIC AND PERMANGANIC ACIDS.

PERMEABILITY, MAGNETIC. See MAGNETISM.

PERMIAN SYSTEM. A name first applied by Murchison in 1841 to a group of rocks occurring in the Province of Perm, Russia. The strata which he included under this name had up to that time been considered as a division of the Triassic. In Russia the Permian strata occupy an area twice the size of France, and they are also largely developed in Germany and in England. In Germany, where the strata are naturally divided into two great series, the name Dyas is commonly applied to the system. Equivalents of the Russian deposits have been described from West Virginia, Kansas, Utah, and Nebraska. While attempts have been made to consider the Permian as coequal with the Carboniferous, still the more common custom is to look upon it as the upper division of the Carboniferous. Consult: Williams, "Correlation Papers—Devonian and Carboniferous," *Bulletin 80 of the United States Geological Survey* (Washington, 1891). See CARBONIFEROUS SYSTEM.

PERMIT (corruption of Sp. *palometa*). A West Indian fish, the great pompano (*Trachinotus Goodii*), also called palometa. See POMPANO.

PERMOSER, pĕr'mō-zĕr, BALTHASAR (1650-1732). A German sculptor, born at Kammer, Bavaria. He was a pupil of Weisskirchner at Salzburg, and of Knacker in Vienna. Afterwards he lived many years in Florence. On his return from Italy in 1704 he lived principally in Berlin and Dresden. His work is able, though tinged by the artificial style of the time. He executed several groups and statues, which were destroyed in the Seven Years' War. His remaining works include a fine pulpit, an "Ecce Homo," and a statue of John the Baptist, in the Catholic church at Dresden, and the monument to Prince Eugene of Savoy in the Vienna Belvedere.

PERMUTATIONS AND COMBINATIONS (Lat. *permutatio*, from *permutare*, to change entirely, from *per*, through + *mutare*, to change, frequentative of *morere*, to move, Skt. *miv*, to push). The different groups of r things which can be selected from a collection of n different things, without reference to their arrangement, are called the *combinations* of n things taken r at a time. For example, the combinations of the four letters *a*, *b*, *c*, *d*, taken 3 at a time, are *abc*, *abd*, *acd*, *bcd*; taken 2 at a time, *ab*, *ac*, *ad*, *bc*, *bd*, *cd*. The different groups of r things which can be selected from n different things, varying the arrangement in every possible manner, are called the *permutations* of n things taken r at a time. E.g. the permutations of the letters *a*, *b*, *c*, taken 2 at a time are *ab*, *ba*, *ac*, *ca*, *bc*, *cb*. The number of combinations of n things taken r at a time is indicated by the symbol C_r^n. The number of permutations of n things taken r at a time is indicated by the symbol P_r^n. The chief properties of permutations and combinations are: (1) The number of permutations of n different things taken r at a time is $n(n-1)(n-2)\ldots(n-r+1)$. E.g. the number of permutations of the letters of the word *courage* taken three at a time is $7 \cdot 6 \cdot 5 = 210$. (2) The number of permutations of n things taken all together is $n(n-1)(n-2)\ldots 3 \cdot 2 \cdot 1 = n!$ (3) The number of permutations of n different things taken r at a time, when each of the n things may be repeated, is n^r; e.g. the number of ways of selecting 3 numbers from 50 on a combination lock, repetitions being allowed, is $50^3 = 125{,}000$. (4) The number of combinations of n different things taken r at a time is $\frac{n(n-1)(n-2)\ldots(n-r+1)}{r!}$, or $\frac{n!}{r!(n-r)!}$. E.g. 3 persons can be selected from a class of 20 in $\frac{20 \cdot 19 \cdot 18}{3!} = 1140$ different ways.

The formulas of permutations and combinations express many relations of both algebra and geometry and possess a peculiar interest in mathematics. E.g. the coefficients in the binomial expansion for a positive integral exponent may be expressed by formulas of combinations thus, $(a+b)^n = a^n + C^n_1 a^{n-1}b + C^n_2 a^{n-2}b^2 + C^n_3 a^{n-3}b^3 + \ldots$. The maximum number of vertices of a general polygon of n sides is expressed by C^n_2. Also, such problems as those of combination locks, of the number of signals with a given system of signs, and of forming all possible numbers from given digits, are solved with unusual brevity by means of the formulas of permutation and combination. This subject was known to the Hindus, particularly to Bhaskara (b.1114), and is related to the subject of probability (q.v.). Its principles are often explained in text-books under the title Choice. By *cyclic* permutation is meant the interchange of the elements of a function in cyclic order. E.g. $(a-b)+(b-c)+(c-a)$ becomes $(b-c)+(c-a)+(a-b)$ by the cyclic interchange of a for b, b for c, and c for a.

PERNAMBUCO, pĕr'năm-bōō'kō. An eastern State of Brazil, bounded by Parahyba and Ceará on the north, Piahuy on the west, Bahia and Alagôas on the south, and the Atlantic Ocean on the east (Map: Brazil, K 5). The area is 49,560 square miles. The coast region is low and the interior is occupied by barren plateaus known as sertãos, which pass into mountain ranges near the western frontier. A long reef of sandstone extends along the coast and forms a great hindrance to navigation. The rivers are mostly short and flow toward the São Francisco, which forms the southern boundary of the State. The low strip of coastland is covered with fine forests and is the centre of population as well as of agricultural activity. In that region are cultivated sugar, cotton, coffee, tobacco, beans, mandioca, and grain. Cattle are raised in the interior. Agriculture in Pernambuco has suffered greatly with the abolition of slavery and the Government has spent large sums in loans and subsidies in order to improve the agricultural conditions of the State. The exports in 1899 were valued at the sum of $12,330,000, and consisted chiefly of cotton, sugar, and coffee. Sugar-refining is the principal industry. Pernambuco has good railway facilities on the coast, where a number of lines lead to the capital and chief seaport of the State, Pernambuco (q.v.). The population was estimated in 1894 at 1,254,159.

PERNAMBUCO, or Recife. The capital of the State of Pernambuco, Brazil, situated on the Atlantic coast at the easternmost point of the continent (Map: Brazil, I, 5). It consists of three parts connected by bridges and causeways; the oldest, or Recife proper, is built on an outlying peninsula, connected with the mainland by an isthmus, and is the principal commercial section; the central part, called São Antonio, stands on an island between a reef and the mainland, and contains most of the public buildings; the third portion, Boa Vista, is built on the mainland, and is the new residential section, with broad streets and beautiful gardens. There are several street-car lines, one of which runs to the suburb of Olinda (q.v.), the former capital of the State. Pernambuco has some of the finest churches and public buildings of the country, and numerous charitable and educational institutions, the latter including a celebrated law school and an excellent secondary college. The harbor proper is inclosed by a reef cut by several navigable passages, but the largest ships have to anchor in an open roadstead. Yet, since Pernambuco is the nearest to Europe of the important ports of Brazil, and owing to its extreme eastern position in the path of nearly all South Atlantic commerce, it has a very considerable shipping, amounting to over 1,000,000 tons annually. It is a station for several lines of Atlantic steamers, and is the outlet for the products of the State, the chief of which are sugar, cotton, rum, skins, and various forest and colonial products. It is the seat of a United States consul. The population by the census of 1890 was 111,556, and in 1898 it was estimated at 190,000, including the suburbs. Recife was founded in 1504. It was held by the Dutch from 1630 to 1654, but it was then a mere village and did not acquire much importance until it superseded Olinda as capital.

PERNAMBUCO WOOD. See Brazil Wood.

PERNAU, pĕr'nou (Russ. *Pernov*). A town in the Government of Livonia, Russia, on both banks of the River Pernau, a short distance from the Gulf of Riga, and 100 miles north by east of Riga (Map: Russia, B 3). It is a well-built town with public gardens, a gymnasium, and a number of benevolent institutions. The trade in grain is still considerable, but the commercial importance of the port has decreased owing to the competition of the other Baltic ports. The town was founded in 1255 by the Bishop of Oesel, and was a flourishing centre in the Middle Ages. It was taken by the Russians in 1710; its fortifications have since been demolished. Population, in 1897, 12,856.

PÉRONNE, pā'rŏn'. A fortified town and the capital of an arrondissement in the Department of Somme, France, on the Somme, 94 miles northeast of Paris (Map: France, J 2). It is historically important: Charles the Simple and Louis XI. were imprisoned here. It was unsuccessfully besieged by the Imperialists under the Count of Nassau in 1536, and acquired the name of La Pucelle, or the 'impregnable,' but in 1815 it surrendered to the English under Wellington. The town was almost destroyed by the Germans, to whom it surrendered, in 1871; it has since been rebuilt. Population, in 1901, 4661.

PERONOSPORACEÆ (Neo-Lat. nom. pl., from *Peronospora*, from Gk. *περόνη, peronē*, brooch, pin + *σπόρος, sporos*, seed). Downy Mildews. An order of 6 or 7 genera of oöphytic fungi parasitic upon higher plants such as tomato, potato, grape, lettuce, etc., which from the abundance of their aerial conidia give an appearance of frost on the under sides of the attacked leaves. Hence the popular name. Their mycelium penetrates every part of the host, and warm moist weather favors their growth. The principal genera are Phytophthora, Plasmopara, Bremia, and Peronospora.

PEROSI, pā-rō'zē, Lorenzo (1872—). An Italian composer of sacred music, born in Tortona. The greater part of his musical education was obtained at the Milan Conservatory, though he went subsequently to Haberl's *Domchorschule* at Regensburg. Meanwhile he had studied for the priesthood and was admitted to the order. In 1897 he produced a sacred trilogy,

La Passione di Cristo, which made him famous throughout Italy. His music is the exact opposite of the English and German oratorio style, which undoubtedly accounts for his lack of success in the musical cities of those nations. In 1898 he became honorary master of the Papal Chapel. Other compositions include *La Trasfigurazione del nostro Signore Gesù Cristo* (1898), *La resurrezione di Lazaro* (1898), *Il natale del Redentore* (1899), and many important masses.

PÉROUSE, *pā'rooz'*, LA. A French navigator. See LA PÉROUSE.

PEROWNE, *pe-roun'*, JOHN JAMES STEWART (1823-1904). An English prelate and author, born at Burdwan, Bengal, where his father was a missionary of the Church Missionary Society. He was educated at Corpus Christi College, Cambridge, and graduated (1848) as Tyrwhitt Hebrew scholar, and in the same year became a priest in the Church of England. He lectured on divinity at King's College, London, and in 1875 was appointed honorary chaplain to the Queen and Hulsean professor of divinity. A member of the Old Testament Revision Committee (1870-84) and Bishop of Worcester (1890-1901), he edited the *Cambridge Bible* (and *Greek Testament*) *for Schools* and *Rogers on the Thirty-Nine Articles*, and wrote *The Book of Psalms, a new Translation* (1864), *Immortality* (1868), the Hulsean Lectures, and an elementary Arabic grammar, *Al Adjrumiieh*.

PEROXIDE OF HYDROGEN. See HYDROGEN DIOXIDE, HYDROGEN.

PERPENDICULAR (Lat. *perpendicularis*, vertical, from *perpendiculum*, plumb line, from *per*, through + *pendere*, to hang). A line is said to be perpendicular to another line when it makes a right angle with it. A line is said to be perpendicular to a plane when it makes a right angle with every line in the plane passing through the point of intersection. One plane is said to be perpendicular to another when their dihedral angle (see ANGLE) is a right angle. See NORMAL.

PERPENDICULAR. The name given to the style of Gothic architecture in England which succeeded the Decorated style. It prevailed from the last quarter of the fourteenth century to the middle of the sixteenth century, and was thus contemporary with the Flamboyant style in France. These styles have much in common, but they derive their names from the features peculiar to each. Thus the Flamboyant (q.v.) is distinguished by the flowing lines of its tracery, while the Perpendicular is remarkable for the stiff and rectilinear lines from which its name was derived. The lines of the window tracery are chiefly vertical, and the mullions are frequently crossed by horizontal bars. The moldings are usually thin and hard. The same feeling pervades the other features of the style; the buttresses, piers, towers, etc., are attenuated, and present in their hollow recesses and meagre lines a great contrast to the deep shadows and bold moldings of the earlier style. The art of masonry was well understood during the Perpendicular period, and the vaultings were admirably built. Fan tracery vaulting (q.v.) belongs to this style. The depressed or four-centre arch is another of its peculiar features. This arch, over doorways, has the moldings generally arranged in a square form over the arch, with spandrels containing shields, quatrefoils, etc. Paneling was also much used, the walls being frequently almost entirely covered with it, as in Henry VII.'s chapel at Westminster. There are many well-known buildings of this style. Most of the colleges at Oxford and Cambridge belong to it, and in almost every cathedral and church of importance there are some specimens of it. Open timber roofs are very common in the Perpendicular style, and are among the peculiar and beautiful features of the architecture of this country. The roof of Westminster Hall, built by Richard II., was the largest example ever erected. Consult the authorities referred to under EARLY ENGLISH.

PERPET'UA, SAINT. See FELICITAS, SAINT.

PERPETUAL MOTION (Lat. *perpetualis*, permanent, universal, from *perpetuus*, continuous, universal, from *per*, through + *petere*, to seek). Under the name of perpetual motion is understood a mechanism which of and for itself, without outside aid, would continue to operate until it wore out. A water wheel under Niagara is not such a machine, because it is the sun which makes the wheel go, by raising the water. Such a machine is incompatible with the principle of the conservation of energy, for some energy would always be converted into heat by friction and this would ultimately stop the machine unless its equivalent were supplied from somewhere. The most varied attempts have been made to disregard this principle and construct such a machine. A large class is that which includes all possible combinations of levers and wheels and worms and pumps, and which invariably reduces to the possibility of a man lifting himself by his bootstraps. Many have tried to employ magnetism in some way, and would have succeeded "if they could find a substance through which magnetism would not act," but an insulator for magnetism is not known, nor will it be as long as energy is conserved. The forces of capillarity and gravitation have been harnessed in the most roundabout ways, but whatever means or agents are employed the aspect of the situation cannot be changed. See ENERGETICS.

PERPETUITY (Lat. *perpetuitas*, continuity, from *perpetuus*, continuous, universal). In a general and inexact sense, a perpetuity is such a limitation of property as suspends the ordinary full ownership and power of disposition beyond the period allowed by law. Properly the 'rule against perpetuities' is a common law rule against the creation of future interests in real or personal property, subject to such contingencies that they may not become vested within a reasonable limited time, arbitrarily fixed by law. It is, therefore, a rule against remoteness of vesting, designed to prevent indefinite control of property by a present owner, by means of provisions in a will or deed to take effect after his death. However, through a misconception of the original object of the rule, the same name has also been applied, though inaccurately, to laws prohibiting the suspension of the absolute power of alienation of property for a prescribed period.

The historical legal conditions under which the rule was developed bear out the conclusion that it was devised by the courts to prevent a present owner from dictating the disposition and extent and method of enjoyment of his property by future generations. By the early English law, a

man might create future interests in his property to vest at any period after his death, and the influence of the feudal system and the doctrine of primogeniture (q.v.) tended to induce the proprietors of the great landed estates to regulate the disposition of their property to remote periods. This practice was gratifying to family pride and was favored by the King and Parliament, as the traditions of a long line of ancestors made loyal subjects of the landed gentry. However, besides making the absolute ownership of land impossible in many cases, thus affecting all classes of people, the practice created great dissatisfaction among younger sons and spendthrift older ones, and as a consequence there were frequent attempts to set aside wills and deeds making such dispositions, which finally resulted in the establishment of the above rule.

The first important case on the point was known as the 'Duke of Norfolk's Case,' in 1685, and it established the limitation that while a future interest might be limited to commence on any contingency, yet the latter must happen within a life or lives in being at the time of the creation of the estate. The period within which springing or shifting uses or executory devises must take effect was later extended to include a gross term of 21 years, in addition to a life or lives in being. For example, if A devises property to his son B for life, remainder to his grandson C for life, and that the property then go to the eldest son of C when he shall attain the age of 21 years, the devise will be held good if C is born prior to the death of A, the testator, as the will takes effect then, and the estate will finally vest absolutely within the period prescribed by the rule, that is, lives in being and 21 years. However, if the property is devised to B for life, and after his death to his eldest son when the latter shall marry, assuming that B has no son at the death of A, the devise is bad, because if a son is born to B, he may not marry within 21 years after the death of B, and as B is the only life in being at the time of A's death, the estate must vest within 21 years after B's death. The possibility that B's eldest son may marry within 21 years will not save the devise as its validity is determined by the possibilities which may happen under its terms, tending to make it bad, and not by the fact that in the course of actual events the estate may become vested within the prescribed period. The same principle applies also to personal property.

The attempt of an English gentleman, Mr. Thellusson, to create an enormous fortune by directing the accumulation of the income of his property during the lives of his children, grandchildren, and great-grandchildren, led to a statute, known as the 'Thellusson Act' (39 and 40 George III., c.98), which forbids the accumulation of income for a longer time than the life of the grantor or settler, or 21 years from his death.

The English common law rule against perpetuities above stated is still the law there, and in most of the United States. However, in several States the common law rule has been radically altered by statute, in that their statutes forbid a suspension of the absolute power of alienation for a longer period than two lives in being and 21 years. In New York the statute fixes the period at two lives in being and a period of a minority, as distinguished from a gross term of 21 years. For a more comprehensive treatment of the subject, see Gray, *Rules Against Perpetuities* (Boston, 1886); also consult the authorities referred to under REAL PROPERTY.

PERPIGNAN, pĕr'pē'nyäN'. The capital of the Department of Pyrénées-Orientales, France, and a fortress of the first rank, on the Têt, five miles from the Mediterranean, and 35 miles south by west of Narbonne (Map: France J 9). It commands the passage to the Eastern Pyrenees from Spain into France, and is defended on the south by a citadel and by ramparts flanked with bastions, and protected by raised works. The houses are of semi-Moresque construction, and there are many evidences of Spanish influence. The Spanish Cathedral of Saint Jean, a massive building, begun in the fourteenth century, has elaborately decorated altars, and a large nave. The belfry of Saint Jacques and the Castillet now used as a military prison, with its battlements and machicolations, are interesting. The old university building contains a museum and a city library of over 20,000 volumes. Perpignan has a college and is the see of a bishop. There are vineyards, olive groves, orchards, and gardens in the vicinity; manufactures of woolen clothes, paper, chocolate, corks, hats, and furs are carried on. Population, in 1891, 33,878; in 1901, 36,157. Perpignan is first heard of in the tenth century. As capital of the former County of Roussillon, it remained long in the hands of the kings of Aragon and of Spain. The town was taken by the French in 1642, and united to France in 1659.

PERRAUD, pâr'rō', JEAN JOSEPH (1819-76). A French sculptor, born at Monay, in the Jura. He was a pupil of the Ecole des Beaux Arts in Lyons, and of the Ecole des Beaux Arts in Paris under Ramey and Dumont, and won the Prix de Rome in 1847. His work is classic, but mannered. His sculpture includes "Adam;" "Adieux;" "Justice," in the Palais de Justice, Paris; "Caryatides," in the National Library, Paris; "Lyric Drama," on the facade of the Opera House, Paris; "Despair" and "The Infancy of Bacchus," in the Louvre. He received a first-class medal in 1855, and was made officer of the Legion of Honor in 1867.

PERRAULT, pâr'rō', CHARLES (1628-1703). A French critic best known for his *Mother Goose Stories*, the classic nursery tales of France. He was born January 12, 1628, in Paris, and was prepared for the bar, but soon forsook the bar for letters, winning distinction and an election to the Academy through his verses and the patronage of Colbert, who made him head of the Royal Bureau of Architecture. He achieved notoriety in 1687 by a poem on *Le siècle de Louis le Grand*, which praised new writers at the expense of the old and so brought on the controversy between the Ancients and Moderns. Attacked by Boileau (q.v.), he defended his position in a series of dialogues, *Parallèle des anciens et des modernes* (1688-96), of more ingenuity than critical value. Better are his 200 studies of *Les hommes illustres qui ont paru en France pendant ce siècle* (1696-1701). But all these, with his *Mémoires* (1749) and two comedies are insignificant beside the *Mother Goose Stories* (1697) through which the literary world first learned to know the *Sleeping Beauty, Little Red Riding Hood, Blue Beard, Puss in Boots, Cinderella* and *Tom Thumb*, which, with Madame d'Aulnoy's

Goldilocks and Madame de Beaumont's *Beauty and the Beast* and *Prince Darling*, form a large and indispensable part of the nursery stock of the world. Perrault published these stories under the name of his son, Pierre Perrault d'Armancour, and called them *Histoires ou contes du temps passé*, with the subtitle *Contes de ma mère l'oie*. Perrault no more invented his stories outright than the Grimm Brothers did theirs; nor did he intend to make a contribution to the knowledge of folk lore. He drew on oral tradition, but he treated his matter in French fashion, and set off fairy fancies with touches of playful realism.

There are many editions of Perrault's *Contes*. The best is probably that of Andrew Lang (London, 1888), with a careful introduction of 115 pages. Consult, also, Deulin, *Contes de ma mère l'Oye avant Charles Perrault* (Paris, 1879).

PERRENOT, pâr'nō', Antoine. A Spanish statesman. See Granvella.

PERRENS, pâr'rāx', François Tommy (1822-1901). A French historian, born at Bordeaux. He received his early education in his native place and was a pupil at the École Normale from 1843 until 1846, when he went to teach at Bourges, then at Lyons (1847), and at Montpellier (1850). From 1853 he was professor at the Bonaparte Lyceum, Paris, and he was inspector of the Academy from 1873 until his retirement in 1891. The thesis *Jérôme Savonarole* (1854), which he wrote for his degree (Doctor of Letters), was crowned by the Academy, and he published also *Etienne Marcel et le gouvernement de la bourgeoisie au XIVème siècle* (1860); *Les mariages espagnols sous le règne de Henri IV.* (1869); *La démocratie en France au moyen âge* (1873); *Histoire de Florence jusqu'à la domination des Médicis* (1877-84); *Histoire de Florence depuis la domination des Médicis jusqu'à la chute de la république* (1888-90); *La civilisation florentine du XIIIème au XVIème siècle* (1893), and *La littérature française au XIXème siècle* (1899).

PERRERS, pēr'ērz, Alice (called also De Windsor) (?-1400). The mistress of Edward III. of England. She is said to have been the daughter of Sir Richard Perrers, of Hertfordshire, and probably married William de Windsor in 1376. She acquired her influence over the King during the lifetime of Queen Philippa, to whom she was lady of honor. The King made her valuable presents, but she became engaged in constant disputes with the courts in her endeavors to acquire maintenance and landed property, and she also used her influence politically to overthrow her enemies or uphold her favorites. She was sentenced to banishment by Parliament, but the decree was not enforced. After Edward's death her sentence of banishment was confirmed by Richard II.'s first Parliament, but was revoked in the following year, and she subsequently regained favor at Court. Her quarrels with the Abbey of Saint Albans led to scurrilous attacks on her character by the monastic chroniclers, but she is praised by the historians Barnes, Carte, and Cotton, and has never lacked defenders. See Edward II.

PERRET, pâr'rā', Aimé (1847—). A French genre painter, born at Lyons. He was the pupil of the Lyons School of Fine Arts, and of Vollon in Paris, and first exhibited in 1872. He paints subjects similar to those of Millet, but his brush shows the brighter side of peasant life. His works, which are very numerous, include "Noce bourguignonne au XVIIIème siècle" (1876); "Baptême bressan" (1877), in the Lyons Museum; "Le saint viatique," in the Luxembourg; "La cinquantaine" (1888); "Noël des vieux;" and "L'heure de l'angélus." He received a second-class medal in 1888, and the cross of the Legion of Honor in 1894.

PERRIER, pâr'ryā', François (called Le Bourguignon) (c.1584-1656). A French painter and engraver, born probably at Saint Jean de Losne (Burgundy). He went to Rome, and there became a pupil of Lanfranco. In 1630 he returned to France and painted some pictures for the Carthusian monks at Lyons. During a second visit to Rome in 1635 he engraved several antique statues and bas-reliefs. These are included in the collections *Statuæ Antiquæ Centum Edente Francisco Perrier* (1638) and *Icones et Segmenta Illustrium e Marmore Tabularum quæ Romæ adhuc Exstant* (1645). He also engraved plates after the old masters. He was one of the twelve founders of the Académie Royale de Peinture et de Sculpture, in 1648. His oil paintings include "Orpheus Before Pluto" and "Æneas and Warriors Fighting the Harpies" in the Louvre. He was an indifferent colorist.

PERRIER, Jean Octave Edmond (1844—). A French zoölogist. In 1867 he became professor in the Lycée d'Agen, in 1872 maître de conférence at the École Normale in Paris, and in 1876 professor of zoölogy at the Museum of Natural History. He was elected to the Académie des Sciences in 1892. He has published *Les colonies animales et la formation des organismes* (1881, 1898); *Les principaux types des êtres vivants* (1882); *La philosophie zoölogique avant Darwin* (1884); *L'intelligence des animaux* (1887); *Eléments d'anatomie et de physiologie animales* (1888).

PER'RIN, Bernadotte (1847—). An American classical scholar, born at Goshen, Conn. He graduated at Yale in 1869 and was a student at the universities of Leipzig and Berlin (1876-79). From 1881 to 1893 he held the position of professor of Greek in Western Reserve University, Cleveland, Ohio. In 1893 he became professor of Greek in Yale University. His published works include an edition of Cæsar's *Civil War* (New York, 1882); Homer's *Odyssey* (i.-iv., Boston, 1889; v.-viii., Boston, 1894); Plutarch's *Lives of Themistocles and Aristides*, trans. with introduction and commentary (New York, 1901). He is also joint editor of the "Twentieth Century Series of Text-Books."

PERRON, pâr'rōn', Anquetil du. See Anquetil Duperron.

PERRONE, pâr-rō'nā, Giovanni (1794-1876). An Italian theologian. He was born at Chieri, in Piedmont, and, after completing his education with the doctor's degree in theology at the University of Turin, he was (in 1815) one of the first to enter the Society of Jesus after its re-establishment. He was professor of dogmatics at Orvieto, and from 1833 to 1848 at the Roman College. At the outbreak of the Revolution in the latter year he took refuge in England, but returned to his professorship when order had been restored, and became rector of the college in 1853. He acquired a reputation for great theological learning, was theologian to several of the Roman

congregations, and had an important share in the condemnation of Hermesianism (see HERMES, GEORG), and in formulating the doctrine of the Immaculate Conception. His most famous work, *Prælectiones Theologicæ* (9 vols., 1835-42), has gone through some 50 editions and been used as a text-book all over the world. Other important works are: *De Immaculato B. V. Mariæ Conceptu* (1847); *Il protestantismo e la regola di fede* (1853); *De Domini Nostri Jesu Christi Divinitate* (1870); *De Romani Pontificis Infallibilitate* (1874).

PER'RONET, EDWARD (1721-92). An English hymn-writer. He was born at Sundridge, Kent, a son of Vincent Perronet (q.v.). He became an itinerant preacher under the Wesleys in 1749, but joined Lady Huntingdon's connection in 1771. He left it shortly after and became minister of a small independent chapel at Canterbury, where he died. He is remembered as the author of the hymn "All hail the power of Jesus' name," which first appeared anonymously in *The Gospel Magazine* (1780). Collections of his hymns and poems have been published, including a satire on the Church of England called *The Mitre* (1757). Consult the article by Grosart in Julian's *Dictionary of Hymnology* (London, 1892).

PERRONET, VINCENT (1693-1785). An English clergyman. He was born in London, of Swiss-French descent; was educated at a school in the north of England and at Christ College, Oxford, where he graduated in 1718; he took orders in the Church of England and became curate in the Parish of Sundridge, Kent. Nine years later he received the vicarage of Shoreham, which he retained for over half a century. In 1744 he became acquainted with John Wesley and later identified himself with the Methodist movement to such an extent that Charles Wesley called him "the Archbishop of Methodism." Perronet wrote several works in defense of the Methodists, also two in vindication of John Locke. His other works deal with the opinions of Hobbes, the Quakers, the subjects of infant baptism, original sin, and recreations.

PERROT, pâr'rô', GEORGES (1832—). A French archæologist, born in Villeneuve-Saint-Georges (Seine-et-Oise), and educated at the normal school and the French school at Athens. In 1861 he went on an archæological expedition to Asia Minor; in 1863 became a professor in the lyceum Louis-le-Grand, in Paris; in 1877, professor of archæology in the university; and in 1883, director of the higher normal school. The most important fruit of his first journal in Asia Minor was the reconstruction of the text of the *Monumentum Ancyranum*. With Chipiez he wrote the valuable *Histoire de l'art dans l'antiquité* (1882 sqq.). Alone he wrote, apart from contributions to reviews, and especially to the *Revue archéologique*, of which he became an editor, *Essai sur le droit public et privé de la république athénienne* (1867), *Les peintures du Palatin* (1872), and *Mémoires d'archéologie, d'épigraphie et d'histoire* (1875).

PER'ROT, Sir JOHN (c.1527-92). An English general, Lord Deputy of Ireland. He was born Harroldston and was probably a natural son of Henry VII. A bold, powerful young fellow, he was made a Knight of the Bath by Edward VI., and under Mary was imprisoned for his Protestant sympathies. Elizabeth, in 1570, made him president of Munster, and with much bravery and energy, but little prudence or tact, he attempted to establish the English Crown in Munster. For a time he was held to have accomplished the task, and in 1584 he was appointed Lord Deputy to carry out the work throughout all Ireland. Under his rule, the western province was pacified, but in the north he was quite unsuccessful. In 1588 he was removed from office, charged with treasonable offers to Philip of Spain, and with contemptuous speech in regard to the Queen. The first charge was entirely groundless, but on the latter count he was clearly guilty, and, although it seems that the Queen purposed to pardon him, he was condemned. He died in the Tower before the sentence could be carried out. His son JAMES (1571-1637) was a prominent member of the Addled Parliament.

PER'RY. A city and the county-seat of Noble County, Okla., 30 miles north northeast of Guthrie; on the Atchison, Topeka and Santa Fe Railroad (Map: Oklahoma, F 2). It is important principally as a commercial centre, being the distributing and shipping point for an extensive farming and stock-raising district. A United States land office is situated here. There are public parks. Population, in 1900, 3351.

PERRY, ARTHUR LATHAM (1830—). An American economist, born at Lyme, N. H. He graduated at Williams College in 1852 and was professor of history and political economy there from 1853 to 1891, when he became professor emeritus. He advocated free trade, and in 1868-69 publicly debated this question with Horace Greeley in Boston and New York. Among his publications are *Political Economy* (1865, 20 editions); *International Commerce* (1866); *Introduction to Political Economy* (1877, 5 editions); *Principles of Political Economy* (1891), and *Williamstown and Williams College* (1900).

PERRY, BLISS (1860—). An American educator, author, and editor, born at Williamstown, Mass. He graduated at Williams College in 1881, was an instructor there in 1881-86, studied in Germany at Berlin and Strassburg universities, and became professor of English at Williams in 1888. From 1893 to 1899 he occupied the chair of English at Princeton University, and in the latter year was appointed editor-in-chief of the *Atlantic Monthly* of Boston. He prepared editions of selections from Burke, and Scott's *Ivanhoe* and *Woodstock*, and edited also a handy selection of representative extracts from the works of English and American writers, entitled *Little Masterpieces*. In addition to addresses on educational topics, he published a series of works of fiction, *The Broughton House* (1890), *Salem Kittredge* (1894), *The Plated City* (1896), and *The Powers at Play* (1899); the chapter on poetry in *Counsel upon the Reading of Books* (1900), a collaborative volume; and *A Study of Prose Fiction*, an essay in literary criticism (1902).

PERRY, EDWARD DELAVAN (1854—). An American scholar and educator, born in Troy, N. Y. He graduated at Columbia in 1875, and studied at Leipzig and Tübingen. Between 1880 and 1895 he was successively tutor in Greek and instructor and professor of Sanskrit at Columbia. In the latter year he became professor of Greek there, and in 1897 he was chosen president of the New York Branch of the American Archæological

Inst[illegible] member of the managing committee [illegible] American Classical School in Athens. I[illegible] 1902 [illegible] became dean of the School of Philosophy at Columbia. An authority on the subject of Greek dialects and inscriptions, he is also known as the author of a *Sanskrit Primer* (3d ed. 1902) based on Bühler's *Leitfaden*.

PERRY, JOHN (1850—). An English physicist and engineer. He was born in Ulster, Ireland, and was educated at Queen's College, Belfast. He was appointed professor of engineering in the Imperial College, Tokio, Japan, in 1875, and, two years after his return to England, professor of engineering and mathematics in the Finsbury Technical College. This position he left after fifteen years, in 1896, and was appointed professor of mechanics and mathematics in South Kensington Royal College of Science. Perry wrote *The Steam Engine* (1874), *Practical Mechanics* (1883), *Spinning Tops* (1890), *Hydraulics* (1892, the Cantor Lectures), *Calculus* (1897), *Applied Mechanics* (1897), *Steam* (1899), *Practical Mathematics* (1899), and *England's Neglect of Science* (1901), besides many contributions to English scientific periodicals.

PERRY, MATTHEW CALBRAITH (1794-1858). An American naval officer, brother of Oliver Hazard Perry (q.v.). He was born at Newport, R. I., entered the navy as a midshipman in 1809, and early in the War of 1812 was one of the officers of the frigate *President*. In 1813 he was transferred to the *United States*, which was blockaded in the harbor of New London until the conclusion of peace. He was then for several years engaged in the merchant service, but having reëntered the navy, he was in 1819 appointed executive officer of the *Cyane*, which convoyed the *Elizabeth* with her band of pioneers to Liberia. Two years later he was again on the African coast as commander of the *Shark*, and recommended the removal of the Liberian colonists from Sherbro to Monrovia. On his return from this voyage, and again in 1822, he took an active part in extirpating piracy in the West Indies. In 1824 he was appointed executive officer of the *North Carolina*, Commodore Rodgers's flagship on the Mediterranean station. He was promoted to the rank of commander in 1826, and in 1832 was again sent to the Mediterranean as captain of the *Concord*. From 1833 to 1843 he was stationed at the Brooklyn navy yard. Under his superintendence was built the *Fulton*, a 'steam battery' designed for the defense of New York Harbor, and the first steam vessel in the United States Navy. When she was completed in 1837 he took command of her, organized her personnel, and so thoroughly demonstrated the practical utility of steam as a motive power for war vessels that he earned the title of "Father of the Steam Navy." In this same year he was commissioned captain and in 1839 was sent abroad to study the latest English and French steam warships. In 1841 he was promoted to be commodore and two years later was assigned to the command of the squadron on the African coast maintained by the United States for the suppression of the slave trade. During the early part of the Mexican War he served under Commodore Conner in the Gulf, but on Conner's recall in 1847 Perry succeeded him in the command of what was then the largest fleet of warships ever assembled under the American flag. In 1852 he was sent by President Fillmore with a squadron of warships to Japan to induce that country to enter into relations with the nations of the West. His flagship, the *Mississippi*, was the first United States steam war vessel to circumnavigate the globe. He arrived in Kurihama, in the Bay of Yedo, on July 7, 1853, and on the 14th delivered to representatives of the Shogun the letter addressed to the ruler of Japan, which declared the nature of his mission. He then went to China, and returning in February, 1854, concluded a treaty with the Japanese by which they agreed to receive an American consul at one of their ports. This treaty, which was followed by one between Japan and Great Britain, inaugurated a new era in the history of Japan. Perry's report was printed by the Government in three volumes, under the title *The Report of Commodore Perry's Expedition to Japan* (1856). He died in New York City. A monument to his memory was unveiled at Perry Park, Kurihama, Japan, on July 14, 1901. Consult Griffis, *Matthew Calbraith Perry, a Typical American Naval Officer* (Boston, 1887).

PERRY, NORAH (1832-96). An American poet, journalist, and writer of juvenile stories, for some years Boston correspondent of *The Chicago Tribune*. She was born in Dudley, Mass. Her verse is collected in *After the Ball* (1875), *Her Lover's Friend* (1879), *New Songs and Ballads* (1886), *Legends and Lyrics* (1890). Her fiction, chiefly juvenile, includes *The Tragedy of the Unexpected* (stories, 1880), *For a Woman*, a novel (1885), *A Book of Love Stories* (1881), *A Flock of Girls and Their Friends* (1887), and many other volumes. These are briskly told and, like her verses, appeal to the sentiment of the broader reading public.

PERRY, OLIVER HAZARD (1785-1819). A distinguished American naval officer. He was born at South Kingston, R. I., and received his education partly from his mother and partly in private schools in Newport and elsewhere. He entered the navy as a midshipman in 1799, served in the war against Tripoli, and in 1807 was commissioned lieutenant. In 1811, as commander of the schooner *Revenge*, he had the misfortune to lose his vessel off Watch Hill, R. I., but a court of inquiry, which at his request investigated the circumstances connected with the wreck, reported him guiltless of any neglect of duty. During the first few months of the War of 1812 Perry commanded a flotilla of gunboats in Newport Harbor, but was later transferred to Sackett's Harbor, N. Y., and thence was soon ordered to Presque Isle (now Erie) to take charge of the construction of a fleet, with which the Americans hoped to wrest from the British the control of Lake Erie. By great exertions he succeeded by the end of the summer of 1813 in building and manning a squadron of nine vessels, with which, on the 10th of September, he won the celebrated battle of Lake Erie. (See ERIE, BATTLE OF LAKE.) He was then able very materially to assist General Harrison in the operations culminating in the battle of the Thames. As a reward for Perry's brilliant victory, he received from Congress a vote of thanks, a gold medal, and the rank of captain. By the people he was regarded as one of the chief heroes of the war, and his laconic despatch announcing his success is today known to every American. Later a very bitter controversy arose between Perry and

Elliott, the commander of the *Niagara*, one of Perry's vessels, over the question of whether Elliott did his duty in supporting the flagship. A court of inquiry, called at Elliott's request, made a somewhat ambiguous report. Subsequently Perry preferred charges against Elliott, but no action was ever taken upon them by the Navy Department. After the close of the war Perry was placed in command of the frigate *Java*, and cruised with Decatur's squadron in the Mediterranean. In 1819 he was sent with a small squadron to the West Indies to protect American commerce against pirates. While performing this duty, he was seized with yellow fever, and died on his birthday, the 23d of August, 1819. He was buried with military honors at Port of Spain, Trinidad, but in 1826 his body was, by order of Congress, removed in the sloop-of-war *Lexington* to Newport, where it was re-interred with great honors. The State of Rhode Island later erected a granite monument to his memory, and there are also statues of him at Newport, and at Cleveland, Ohio. His life has been written by Niles (Hartford, 1820), by Mackenzie (New York, 1843), by James Fenimore Cooper (in *Lives of Distinguished American Naval Officers*, Auburn, N. Y.), and by Barnes (New York, 1898).

PERRY, Stephen Joseph (1833-89). An English astronomer, born in London. He studied theology at Douai and Rome, entered the Society of Jesus in 1853, and studied mathematics at Stonyhurst, at the University of London, and at that of Paris. In 1868 he began a magnetic survey of France. Two years afterwards, as fellow of the Royal Society, he was stationed at San Antonio, Cadiz, to observe the total eclipse of that year; in 1874 he directed the observations of the transit of Venus on Kerguelen Island; and in 1882 was sent to Southwestern Madagascar with another transit of Venus expedition. Perry died in the Salut Islands, where he caught a severe cold in attempting to photograph the total eclipse of December 22, 1889. His generosity fitted up the Stonyhurst Observatory. Perry was an able and popular lecturer. In 1881 he discovered, independently of Trouvelot, the veiled sun spots. Consult Cortie, *Father Perry, the Jesuit Astronomer* (London, 1890).

PERRY, Thomas Sargent (1845—). An American educator and critical historian of literature, born in Newport, R. I. Perry graduated at Harvard (1866), and after studying in Berlin and Paris taught, at Harvard, German (1868-72) and English (1877-81). In the interval he was for two years editor of the *North American Review*. He afterwards wrote *Life and Letters of Francis Lieber* (1882), *English Literature in the Eighteenth Century* (1882), *A History of Greek Literature* (1883), *From Opitz to Lessing* (1885), and *The Evolution of the Snob* (1887).

PERRY, William Stevens (1832-98). An American clergyman, second Protestant Episcopal Bishop of Iowa. He was born at Providence, R. I., studied at Brown University, but took his degree from Harvard in 1854. He studied theology at Virginia Seminary and continued his studies with the Rev. Alexander Hamilton Vinton. He was ordained priest at St. Paul's, Boston, in 1858, where he spent the first year of his ministry. His succeeding charges were Saint Luke's, Nashua, N. H.; Saint Steven's, Portland, Me.; Saint Michael's, Litchfield, Conn.; and Trinity, Geneva, N. Y. He taught history at Hobart College for several years and served the institution as president from April to September, 1876, when he was consecrated Bishop of Iowa. He did much for the cause of education in his diocese; reopened Griswold College in its academic, theological, and preparatory departments, founded St. Katharine's Hall for girls, Kemper Hall for boys, and Lee Hall for training candidates for orders. He also founded St. Luke's Hospital at Des Moines. Among his writings are *Documentary History of the Protestant Episcopal Church in the United States of America* (with Dr. F. L. Hawks, 1863-64), *Historical Collections of the American Colonial Church* (5 vols., 1871-78), *Historical Notes and Documents Illustrating the Organization of the Protestant Episcopal Church in America* (1874), *Historical Sketch of the Protestant Episcopal Church, 1784-1884* (1884). Consult sketch and bibliography in his *Episcopate in America* (New York, 1895).

PER'RYVILLE, Battle of. A battle fought at Perryville, Ky., about 40 miles south of Frankfort, on October 8, 1862, during the Civil War, between a Federal force of about 22,000 men, actually engaged, under General Buell, and a Confederate force of about 17,000 men under General Bragg. The Confederates opened the engagement at about 2 o'clock in the afternoon by an attack upon the Federal left under McCook, and for a time drove it back, but were finally forced back themselves through the town of Perryville. During the night the Confederates retired from the field. By many the engagement has been considered a drawn battle, though strategically it is generally regarded as a victory for the Federals. General Buell's forces in the vicinity of Perryville numbered about 58,000 men, less than half of whom were actually engaged in the battle. The Confederates lost, in killed, wounded, and missing, 3396; the Federals, 4211. Consult Johnson and Buel (eds.), *Battles and Leaders of the Civil War*, vol. iii. (New York, 1887).

PER'SÆ (Lat., from Gk. Πέρσαι, Persians). A play of Æschylus, produced at Athens in B.C. 472, with three other dramas, *Phineus*, *Glaucus*, and *Prometheus*. It is notable as being the only extant ancient drama the subject of which is not mythological. Its subject is the defeat of the Persians, with a fine description of the battle of Salamis. The scene is laid at Susa. The actors are Atossa, the mother of Xerxes; Xerxes himself, a messenger, and the Shade of Darius. The chorus consists of aged Persian nobles.

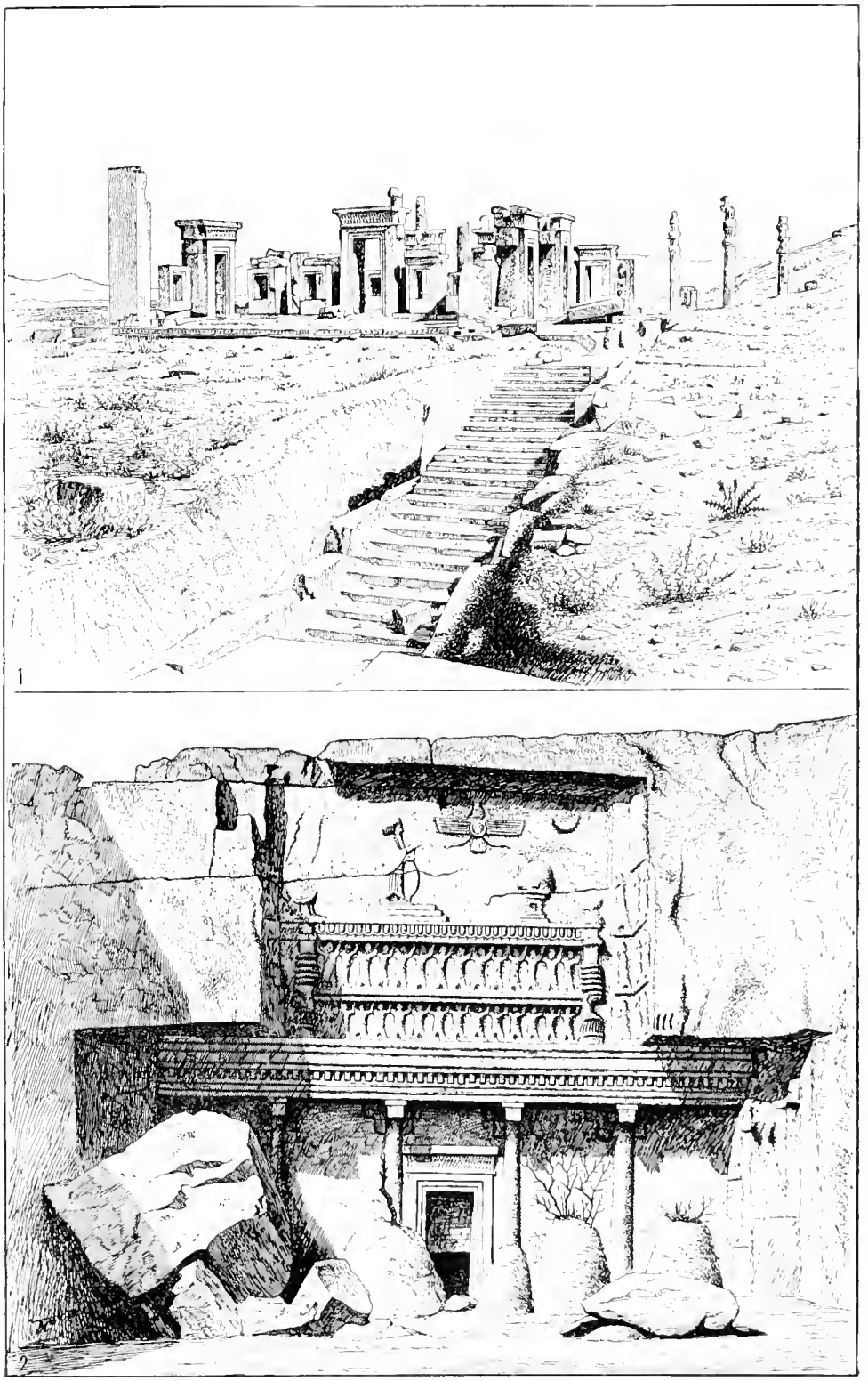
PERSECUTIONS OF THE CHRISTIANS, The Ten. A phrase that has been in very general use since the fifth century. The number, however, has no basis in fact, and was suggested by the ten plagues of Egypt, and the ten horns of the beast in the Book of Revelation (xvii. 3 sqq.), interpreted, in accordance with the allegorizing spirit of the time, as types of ten emperors. There were only two persecutions coterminous with the Roman Empire, and directly prompted by Imperial action, that under Decius in 250, and that under Diocletian and his associates, 303-313. On the other hand, if provincial and local persecutions be taken into account, the number is far too small. So far as known, Claudius (41-51) was the first Roman Emperor to attempt

are a sort of persecution of the Christians. Suetonius states that he expelled the *Jews* from Rome. The reason is not altogether clear, but a very plausible interpretation is that, at this early date Christian converts being mainly Jews, the Government regarded the former merely as a sect of the latter, and the decree was occasioned by disorders arising in the city because of conflicts between non Christian and Christian Jews, leading to the expulsion of both. The date is uncertain; it has been placed in 52, but may have been earlier (cf. Acts xviii. 2). The ten persecutions as commonly given, with the date fixing approximately either the beginning or period of greatest severity, are: That under Nero, 64; under Domitian, 95; under Trajan, 112-113; under Marcus Aurelius, 177; under Septimius Severus, 202; under Maximinus, 235; under Decius, 250; under Valerian, 257; under Aurelian, 274; under Diocletian and his successors, 303-313. Consult, besides the Church histories: Gibbon, *Decline and Fall of the Roman Empire*, chaps. xiii., xiv., and xvi.; Renan, *Les origines du christianisme* (Paris, 1863-82); Allard, *Histoire des persécutions* (Paris, 1884-94); id., *Le christianisme et l'empire romain* (Paris, 1897); Ramsay, *The Church in the Roman Empire Before 170* A.D. (London, 1894); Weis, *Christenverfolgungen* (Marburg, 1901); Hardy, *Christianity and the Roman Government* (London, 1894). For the sources, consult Preuschen, *Analecta* (Freiburg, 1893); *Translations and Reprints published by the Department of History of the University of Pennsylvania*, vol. iv., No. 1 (Philadelphia, 1897). See MARTYR.

PERSEPH'ONE. See PROSERPINA.

PERSEP'OLIS (Lat., from Gk. Περσέπολις, Περσαίπολις, City of the Persians). The Greek name of the capital of the Persian Empire under Darius I. and his successors. The native name is unknown. The locality is identified with the principal group of ruins, the Takhti Jemshed or Throne of Jemshed, the traditional founder of Persepolis, and is called also Tchil Minar or Forty Pillars. The city is supposed to have extended throughout the whole valley of the Medus above its confluence with the Araxes (now the Polvar and the Bendemer respectively), overlooking the beautiful mountain-girt and fertile plain of Murghab, north of Lake Tashk or Nargis. Part of the site was occupied later by the important Sassanian city of Istakhr. The only remains of Persepolis are the ruins of buildings erected by Darius Hystaspis, Xerxes, Artaxerxes, and other Achæmenians, which are scattered throughout the valley of the Polvar, about 30 miles northeast of Shiraz on the road to Ispahan. The ruins comprise three principal groups: (1) Takhti Jemshed, already referred to, situated at the foot of a lofty mountain range, in which, at a considerable elevation, hewn out of the solid rock, are three finely sculptured sepulchres; (2) Nakṣ-i-Rustam—the picture of Rustem, so called from the relief adornments—consisting of four similar rock-hewn sepulchres cut in a perpendicular cliff at a considerable height, about six miles to the northeast on the opposite bank of the Polvar; (3) the remains at Haji Abad on the Polvar, about four miles north of Takhti Jemshed, of an ancient fire temple, which was in a perfect state of preservation in the tenth century A.D., and then served as the mosque of the city of Istakhr. The tombs of Nakshi Rustem are those of Darius I., which bears a long inscription identifying it, and probably of Xerxes I., Artaxerxes I., and Darius II., and those behind Takhti Jemshed once held the bodies of Artaxerxes II., Artaxerxes III., and Darius III.

Takhti Jemshed, the most important of the groups of ruins, is situated on a vast terrace of cyclopean masonry built at the base of and backed by the Mountain of the Tombs. The vast substructure is about 1500 feet north by south, and about 800 feet east by west, and was surrounded, according to Diodorus Siculus, by a triple wall of 16, 32, and 60 cubits respectively. The whole area is further divided into three terraces, the lowest toward the south, the northern about 550 feet long and 35 feet high, the central 800 feet square, and rising 45 feet above the plain. No traces of structures are to be found on the lowest platform; the northern supports the Propylæa of Xerxes; and the central platform was occupied by the foremost structures, distinguished as the Great Hall of Xerxes, the Palace of Xerxes, and the Palace of Darius, towering one above the other in successive elevations from the ground. The stone used for the buildings is dark gray marble, cut into gigantic square blocks, and in many cases exquisitely polished. The ascent from the plain to the great northern platform is formed by two double flights, the steps of which are nearly 22 feet wide, 3½ inches high, and 15 inches in the tread, so that travelers have been able to ascend them on horseback. The Propylæa of Xerxes on this platform are two masses of stonework, which probably formed an entrance gateway for foot passengers, paved with gigantic slabs of polished marble. Portals still standing bear figures of animals 15 feet high, closely resembling the Assyrian bulls of Nineveh. The building, conjectured to have been a hall 82 feet square, is, according to the inscription, the work of Xerxes. An expanse of 162 feet divides this platform from the central one, which still bears many of the columns of the Hall of Xerxes, from which the ruins take their subsidiary name. The staircase leading up to the Tchil Minar or Forty Pillars is, if possible, even more magnificent than the first. The walls are more richly decorated with sculptures, representing colossal warriors with spears, gigantic bulls, combats with wild beasts, and processions; while broken capitals, shafts, pillars, and countless fragments of buildings, with cuneiform inscriptions, cover the whole vast space of this platform. The pillars were arranged in four divisions, consisting of a central group six feet deep every way, and an advanced body of twelve in two ranks, the same number flanking the centre. Only thirteen of the columns now remain. Their form is very beautiful. Their height is 60 feet, the circumference of the shaft 16 feet, the length from the capital to the torus 44 feet. The shaft is finely fluted in 52 divisions; at its lower extremity begin a cincture and a torus, the first two inches in depth, and the latter one foot, whence devolves the pedestal, shaped like the cup and leaves of the pendent lotus, the capitals having been surmounted by the double semi-bull. The Great Hall of Xerxes is computed to have been a rectangle of about 300 to 350 feet, and consequently to have covered 2½ acres. Behind the Hall of Xerxes was the so-called Hall of a Hundred Columns, to the south of which are indications



1. PALACE OF DARIUS

2. FIRST OF THE TOMBS OF THE KINGS

of another structure, termed the central edifice. Next along the west front stood the Palace of Darius, and to the south the Palace of Xerxes, measuring about 86 feet square, similarly decorated.

Persepolis replaced Pasargadæ (q.v.) as the capital of Persia under Darius I., by whom and his successors the city was extended and enlarged. It surrendered to Alexander the Great (B.C. 331) after the defeat of Ariobarzanes at the battle of Gaugamela. Ariobarzanes again offered battle, but was killed, whereupon Alexander ordered a general massacre, sacked the city, and, acting—it is doubtfully chronicled—on the suggestion of Thais the courtesan, fired the palaces of Takhti Jemshed. Although fifteen years later Persepolis was still the capital of Persia, it gradually sank into insignificance, until upon its ruins Istakhr rose into prominence about A.D. 200, and for centuries was a considerable centre of administrative, religious, and commercial activity. It was a formidable opponent of the Moslem invasion, suffered severely, and also passed out of existence, but, unlike its great predecessor, left few traces of its ancient glory.

Consult: Vaux, *Nineveh and Persepolis* (London, 1850; 4th ed. 1852); Fergusson, *The Palaces of Nineveh and Persepolis Restored* (ib., 1851); Rawlinson, *The Five Great Monarchies*, vol. iii. (ib., 1871); Myers, *Remains of Lost Empires* (New York, 1875); Stolze, *Persepolis* (Berlin, 1882); Dieulafoy, *L'art antique de la Perse* (Paris, 1884-89); Blundell, "Persepolis," in *Transactions of the Congress of Orientalists*, vol. ii. (London, 1892); Curzon, *Persia and the Persian Question* (ib., 1892).

PER'SEUS (Lat., from Gk. Περσεύς). In Grecian legend, the son of Zeus and Danaë (q.v.), and grandson of Acrisius, King of Argos. As his grandfather had been warned that he would perish by the hand of Danaë's son, he inclosed mother and child in a chest and cast them into the sea. They drifted to the island of Seriphos, where they were cared for by Dictys, brother of the King, Polydectes. The latter fell in love with Danaë, and as Perseus, now grown to manhood, interfered with his plans, he sent him to bring the head of Medusa, the Gorgon. Guided by Athena, he found the Graeæ, old women with but one eye and one tooth between them, who directed him to the nymphs, from whom he received winged sandals, a pouch, and the cap of Hades, which, like the Tarnhelm of Teutonic story, made the wearer invisible. Hermes provided him with a harpe (ἅρπη) or scimitar, and Athena with a bronze shield, in which as a mirror he could see the face of Medusa without encountering her glance, which turned all living things to stone. After a long journey, which the poets gradually filled with adventures, he reached the distant home of the Gorgons, found them asleep, identified Medusa, cut off her head, and escaped by the aid of his magic helmet. On his return he rescued Andromeda (q.v.), daughter of King Cepheus of Ethiopia (variously localized in this story), and took her with him to Seriphos, where he found his mother and Dictys suppliants at the altar, for Polydectes had resorted to violence. Medusa's head turned Polydectes and his followers to stone, and Perseus sent his magic weapons to the nymphs by Hermes, and gave the head to Athena, who placed it on her ægis. Perseus with his wife and mother then returned to Argos, and found that Acrisius had fled to Larissa, in Thessaly. Perseus followed, and accidentally killed his grandfather while throwing the discus during some games. Returning, he exchanged the rule of Argos for that of Tiryns and later founded Midea and Mycenæ. Perseus is originally the local deity of the spring Perseia by Mycenæ, as Danaë is the ancestor of the Danaans of Argolis. The slaying of Medusa and the rescue of Andromeda were favorite subjects of ancient art, and are found on early vases and Pompeian wall-paintings, as well as in sculpture. They are catalogued and discussed by Knatz, *Quomodo Persei Tabulam Artifices Graeci et Romani Tractaverint* (Bonn, 1893). For the study freely told in English, consult William Morris, "The Doom of King Acrisius," in *The Earthly Paradise* (London, 1868).

PERSEUS (c.212 B.C.-?). The last King of Macedonia, the eldest son of Philip V. He was born about B.C. 212. He was from his earliest years trained to a military life, and, having compassed through intrigue the death of his brother Demetrius, who was a favorite both with the Macedonians and with the Romans, and whom he for that reason regarded as a dangerous rival, he ascended the throne on the death of his father in B.C. 179. A struggle with Rome was inevitable, and Perseus was well prepared for it. His treasury and magazines were full, his army amounted to over 40,000 trained men, his alliances were strong, and he was himself popular with his subjects and neighbors. He sought, however, to postpone the inevitable as long as possible, but matters came to an open rupture in 171. In that year the Consul Publius Licinius Crassus was sent against him. The blunder of the Romans saved Perseus. Crassus was defeated at Callicinus in Thessaly. But Perseus failed to follow up his victory, and the war was continued without decisive result for a number of years. Finally, in the month of March, 168, Lucius Æmilius Paulus arrived in Greece to take command of the Roman forces, and on June 22d of the same year the Macedonian army was utterly defeated in the battle of Pydna. Perseus fled, but afterwards fell with all his treasures into the hands of the Romans. After gracing the triumph of the consul at Rome, he was held in captivity several years at Alba Fucens, in Italy, where he at length died. Consult: Droysen, *Geschichte des Hellenismus* (2d ed., Gotha, 1877-78); Freeman, *History of Federal Government* (2d ed., New York, 1893); Mahaffy, *Alexander's Empire* (New York, 1888).

PER'SHORE. A market-town in Worcestershire, England, on the Avon, nine miles southeast of Worcester (Map: England, D 4). It is noted for the Church of the Holy Cross, the only remaining portion of the famous abbey founded in 685. Vegetable gardening is largely carried on, and there are manufactures of stockings, and engineering and machine works. Population, in 1891, 9100; in 1901, 8800. Consult Styles, *History of Pershore Abbey Church* (London, 1839).

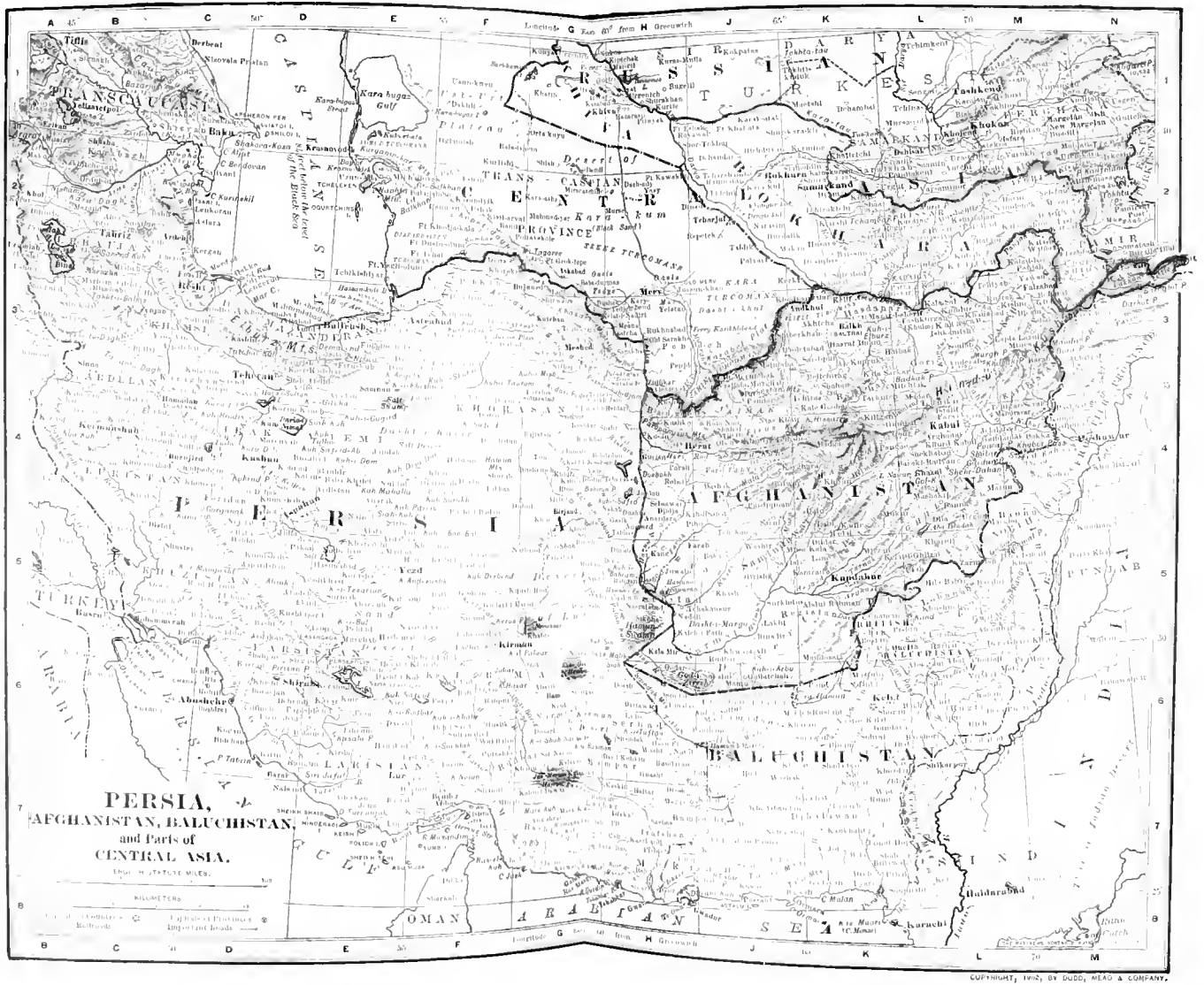
PERSIA, pēr'shȧ *or* pēr'zhȧ (Lat. *Persia, Persis*, from Gk. Περσίς, from OPers. *Parsa*, Pers. *Pārs*, Ar. *Fārs*, Persia). A native State of Southwestern Asia, called by the inhabitants Iran, the

name Persia (Farsistan) being applied only to a small province. It extends from latitude 25° N. (Cape Jask, near the Baluchistan frontier) almost to latitude 40° N. (Aras River on the border of Transcaucasia), and from longitude 44° E. (Armenia) to longitude 63° E. (Baluchistan). A line extending northwest and southeast, nearly bisecting the country, is 1400 miles long. Its greatest north and south extent, from Ras el-Kuh on the Strait of Ormuz to its most northern point on the frontier of Russian Turkestan, is 875 miles. The country is bounded on the north by Transcaucasia, the Caspian Sea, and Russian Turkestan, on the south by the Indian Ocean and Persian Gulf, on the east by Russian Turkestan, Afghanistan, and Baluchistan, and on the west by Asiatic Turkey and the Persian Gulf. It is over one-fifth as large as the United States, excluding Alaska, having an area of about 642,000 square miles.

Topography. Persia is an elevated tableland from 3000 to 5000 feet in general altitude, sinking to the Caspian Sea and the plain of Turkestan in the north and to the Persian Gulf in the south, and embracing the western and larger portion of the great Iranian plateau, which includes Afghanistan and Baluchistan. To reach this plateau great mountain barriers must be crossed on all sides excepting in the east, where the tableland and mountains merge imperceptibly with those of Afghanistan and Baluchistan. On the other three sides great mountain ranges stretch between the interior plateau and the narrow plains which slope to the Caspian Sea on the north, and the Persian Gulf on the south, and merge with the plains of Asiatic Turkey on the west. The plain of the Caspian presents a wonderful contrast to the colorless, waterless, and treeless expanse of the plateau to the south from which it is separated by the Elburz Mountains. It comprises the maritime provinces of Mazanderan and Ghilan, so rich in water that many swamps and lagoons breed miasma, and so abundantly covered with forests and undergrowth that it is often difficult to force a way through the dense vegetation. Furthermore, it possesses a degree of atmospheric humidity that is seldom found outside of the tropics. Most of the towns are among the forests on the lower slopes of the mountains. For purposes of agriculture and fruit-raising this is the most favored part of Persia. Many large and small plantations have been cleared in the forests, and all the cultivated crops of Southern Europe, including the mulberry for silk manufacture, attain high perfection. This luxuriance of vegetable life is due to the vapor-charged clouds of the Caspian, which are brought south by the prevailing winds, and, impinging upon the northern slopes of the Elburz, descend in mist and rain to the lowlands.

Along the southern maritime border the mountains, low in elevation and extending east and west, often closely approach the sea, and the narrow plains between them and the ocean are dry and barren excepting in certain districts where the rainfall, supplemented by irrigation, suffices for agriculture. Nearly all the mountains of Persia are bleakly sterile in aspect. The most imposing of the mountain ranges is the Elburz, which, continued eastward by the Kuren Dagh, Kopet Dagh, Ala Dagh, and Binalud Kuh, stretches like a mighty mountain wall along the entire northern border of Persia. The Elburz, from 10 to 30 miles south of the Caspian, may be crossed by a few passes or defiles, some of them at an elevation of over 8000 feet. Its upland valleys, with an average elevation of about 4000 feet, are dominated by peaks rising from 8000 to 11,000 feet above the sea; and towering above them all is Demavend, a nearly extinct volcano, about 18,500 feet high, the culminating point of Persia. From its ice-filled crater, on a clear day, the eye may survey a panorama spread over 50,000 square miles, embracing the Caspian, the mountain ranges of the north and west, and the dry expanse of the tableland with patches of green oases and the outlines of many towns. The wide mountain lands of Western Persia extend in many parallel ranges throughout the whole of that part of the country overlooking the valley of the Tigris and the Persian Gulf. Their trend is from northwest to southeast. They form the mountain barrier between Persia and Turkey and are known collectively as the Zagros Mountains. Some of the peaks are snow-crowned most of the year, and Mount Alijuk, south of Ispahan, is 14,000 feet in elevation. But the culminating range of these highlands is the Kuh-Dinar, extending north of Shiraz, whose highest summit, the Kuh-i-Dena, is over 17,000 feet in elevation, second only to Demavend. Islands along the east coast of the Persian Gulf are merely the partly submerged fragments of the coast ranges.

The tableland of the interior, thus walled in by mountains, is itself intersected by numerous ranges and detached masses of mountains, excepting in Eastern Persia, where great plains and deserts are the main topographic feature. Between these ranges, also extending northwest and southeast, are wide plains and narrow valleys. These plains and valleys would be utterly sterile were it not for the mountains near them, which collect rain and snow. The valleys are more easily irrigated, and are thus more fertile than the plains, which are here and there brightened by a patch of green oasis, but for the most part are sandy and barren. The general aspect of the plateau is that of a cheerless and monotonous waste stretching to the base of mountains that are equally bleak and uninviting, and reaching the acme of frightful desolation in the two deserts of the east, the Dasht-i-Kavir or Great Salt Desert, extending between latitudes 33° and 36° N., and from longitude 52° to 57° E., and the more southerly Dasht-i-Lut or Great Sand Desert, extending between latitudes 29° and 32° N., and between longitudes 57° and 60° E. Their combined length is over 500 miles from northwest to southeast, but they are separated between the thirty-second and thirty-fourth parallels by a hilly region through which passes one of the main caravan routes between Central Persia and Meshhed. The origin of the Great Salt Desert is not yet clearly determined. One theory is that it is due to the drainage of saline streams from the surrounding higher lands and the consequent deposition of a white crust or efflorescence; the other theory is that it is the bed of an ancient salt lake. Geologists now incline to the latter explanation. In 1891 a solid bed of rock salt estimated at over 600 square miles in area and several feet in thickness was discovered in this remarkable region. Lieutenant Vaughn and Mr. C. E. Biddulph, who brought to light this sea of solid rock salt,



which is probably unrivaled in the world, found it so hard that with iron tent pegs they were able to detach only a few chips.

The Dasht-i-Lut or Great Sand Desert, which separates the Province of Khorasan from that of Kirman, has salt also as one of its chief ingredients, but it is rarely overlaid like the more northern desert with saline incrustations or briny swamps. It gives life to a few poor shrubs, while nothing grows in the other desert. Sand is its prevailing feature. It is much lower in altitude than the Great Salt Desert, its average elevation being less than 2000 feet, while in places it sinks to only 500 feet above sea-level. All these topographic aspects have a marked effect upon the distribution of the population. The lines of villages and cities follow the trend of the mountains from east to west across North Persia and from northwest to southeast across Western and Central Persia, because only in the neighborhood of the mountains can water be obtained to supply the towns and nourish the gardens and fields. Where the ranges spread far apart, and in Eastern Persia, where there are few high elevations, there is only a sprinkling of human inhabitants. Desolation reigns over vast expanses.

Hydrography. The waters of two-thirds of Persia do not reach the sea, but are lost in inland swamps or lakes or disappear in the sands. Few rivers are worthy of special mention. Among them is the Karun, which drains a large part of the mountainous provinces of Luristan and Khuzistan, empties into the Persian Gulf, and is nearly four feet deep throughout the year. A small steamer, subsidized by the British Government, is now making regular trips 150 miles up the river to Ahwaz, where rapids and ledges obstruct navigation. No other river is navigable. The Sefid Rud, Atrek, and Gurgan, draining the northern slopes of the Elburz, and its prolongations, are the only considerable streams entering the Caspian. The streams flowing to the inland basins are much inferior in volume to those emptying into the sea. Only two lakes are of importance. Lake Urumiah lies in the extreme northwest and from its surface the snowy top of Mount Ararat may be seen. It is so heavily charged with salt that swimmers cannot dive in it. Its wooded shores and islets give a pleasing impression, but the average depth is only about 15 feet, and, though it covers an area of about 1600 square miles, its volume is six or seven times inferior to that of Lake Geneva in Switzerland. The great salt lake of Southern Persia is Niriz, much smaller than Urumiah and with a greatly indented and fantastic outline.

Climate. The winter cold is intense on the high tableland. The summers are very warm, but there is little humidity, and the dry, clear heat is temperate compared with that of Northern India. On the other hand, the air is damp and relaxing in the forest-covered lowlands of the Caspian, and the southern maritime tracts are very dry and hot at most seasons. Spring and autumn are the most enjoyable parts of the year. The average annual rainfall perhaps does not exceed 10 inches in any part of the country excepting along the Caspian, where the lowland Caspian provinces have a rainfall about five times greater than that of the highlands. The soils, composed of a mixture of sandstone, limestone, and volcanic débris washed down from the mountain slopes, are very productive.

Flora. As Persia is a land of transition between Eastern Asia and the Western World, its flora partakes of the character of the surrounding lands. The zones of vegetation succeed one another quite abruptly. Polar species, for example, are found on the higher summits of the north, while wheat is cultivated at heights of 9000 feet, and rice and the fruits of Southern Europe thrive on the neighboring lowlands. Except on the Caspian seaboard, the Persian flora is poor in varieties. Over most of the plateau the konar tree, cyprus, dwarf oak, walnut, and mulberry are almost the only timber encountered. But the rich humid valleys of the Caspian belt and the lower slopes of the Elburz produce timbers of great variety, including the oak, ash, beech, elm, alder, birch, sycamore, cherry, and thorn. In the same region the fruits of Europe and of Asia meet and are grown in great variety. Among the medicinal products are gum tragacanth, gum arabic, asafœtida, and several others; indigo, henna, madder root, saffron, gall nuts, and other dyestuffs are also valuable products. The rose is preëminent among flowers and attar of roses is among the famous productions.

Fauna. The animals of Persia differ little from those of the neighboring lands. In the forests of the Caspian plain are the hare, fox, wolf, hyena, jackal, leopard, tiger, lynx, and wild boar. On the mountains are seen the ibex, mountain sheep, wild goat, antelope, and bear. The maneless lion sometimes attacks human beings, but preys chiefly on the wild boar. Although the Persian fauna is poor in number of species, the reptiles, especially lizards, are represented by many varieties. Owing to the general aridity of the land, snails and other land mollusks are nowhere found. The domestic animals include fine horses and mules, single-hump camels, sheep of the fat-tailed species yielding a fine quality of wool, dogs, and several species of falcons that are trained for the chase.

Geology and Mineral Resources. Most of the tableland and mountains are of sedimentary formation, largely sandstone, Tertiary limestone, chalks, and Cretaceous nummulitic rocks. But interspersed among these sedimentary rocks are mountains built up of eruptive rocks and volcanic ash such as mounts Demavend, Savalan, and many others. The deserts are composed mainly of saline and sand accumulations. The mineral resources are enormous, but are largely undeveloped. Roughly speaking, there are six mineral producing zones: (1) the Province of Azerbaijan, in the northwest, where iron, copper, lead, and coal are found; (2) the northern and southern slopes of the main Elburz range, where iron and coal occur near each other, Teheran deriving its coal supply from this region; (3) Khorasan, the rich northeastern province, which contains the famous turquoise mines of Nishapur, and in which are obtained considerable quantities of copper, coal, and salt; (4) the Province of Kirman, with copper, lead, manganese ore, and fine marble; (5) the highly mineralized districts in the central mountains, with iron, antimony, nickel, cobalt, copper, lead, sulphur, and asbestos; and (6) the Persian Gulf littoral, with naphtha, rock salt, iron, ochre, gypsum, nitrates, and sulphur. While Persia abounds in remark-

able mineral resources, their commercial value is chiefly dependent on the cost of transportation to the coast or nearest markets. In the absence of good roads, the minerals of large parts of Persia must long remain almost untouched.

AGRICULTURE. Tillage in Persia depends upon the water supply. The detritus swept down by the streams or torrents deposits a layer of soil upon the sand, which is subsequently fertilized by the same agency that brought it. A large amount of cultivable land is not yet utilized. Cereals, chiefly wheat, barley, and rice, are grown throughout the country. Sugar-cane is sparsely cultivated and coarse sugar is made, but large imports from Russia and France are necessary. Cotton, short in staple, thrives to an elevation of 5000 feet above the sea, and over 100,000 bales are annually exported to the mills of Bombay and Marseilles. Silk is produced in the Caspian provinces to the amount of 500,000 pounds (weight) a year, most of it going to Yazd, Kashan, and Ispahan, the centres of the manufacturing trade; and in 1899 1,171,601 pounds of cocoons were sent to Europe. Persian tobacco is known throughout Western Asia for its superior quality. The home consumption is enormous, and over 5000 tons are exported to other Asiatic countries and Egypt. The production is roughly estimated at over 50,000 tons a year. The poppy has been widely cultivated since 1864, chiefly in the central and southern provinces, with an average production of over 6000 chests of opium. Most of it is sold to China, but the purest quality is sent to London for the extraction of morphine and is in part reëxported to America. Indigo grown in the southwest is used in the dyeing of cotton. Nearly every house has its vegetable and tangled but beautiful flower garden. The fruits include the grape, plum, raspberry, apple, pear, peach, and apricot; and Persia is said to produce the finest melons in the world. Dates are grown along the Persian Gulf and are sold abroad. The implements of tillage are extremely primitive.

Persia has great sources of wealth in its animal products. The sturdy Persian horse, excellent for cavalry or ordinary purposes, is exported to India. The mule, though small, has extraordinary strength and endurance. The best camels of Khorasan carry 600 pounds at the rate of twenty miles a day. Skins and hides are exported in large quantities to Bagdad and Russia. Persian lamb skins are famous. Sheep's wool (about 9,000,000 pounds exported annually) and goats' hair are used in making cloths and shawls. The shores of the Caspian and the rivers emptying into it are richly stocked with fish, and a Russian has the monopoly of preparing caviare from the sturgeon and sterlet.

MANUFACTURES. The chief manufactures are silk, woolen, and cotton tissues, and artistic fabrications. Broadly speaking, there are no factories, the output being the work of private shops or the production of special, localized schools of industry. Almost every large town has its own special manufactures which cannot be procured elsewhere. The most important and best known of the textile fabrics is Persian carpet, of which there are about 30 different kinds, all hand-made and the design varying with each carpet. Each kind has its own characteristics, so that it is easy to distinguish between the products of different districts. Carpets are sent to Europe and America, the exports amounting to over $700,000 a year. The woolen shawls of Kirman made of goats' hair are also famous. Cotton fabrics, chintzes, velvets, silks, and embroideries are produced in considerable quantity, though the cheaper fabrics of European looms have injured all the home textile industries including that of carpets. For illustration, see Colored Plate under the article RUGS.

The earthenware and faïence of Old Persia were its most famous artistic products. The ceramic arts, however, have now largely disappeared. Enameling in gold, silver, and copper is the best surviving relic of the ancient metal work. Native artisans still excel in copper, glass, and filigree work, and carvings. The lack of good means of transportation, the neglect of the Government, the apathy of the people, and the invasion of foreign products are responsible for the undoubted decline of Persia in the manufacturing arts.

COMMERCE. The Russian frontier is within 80 miles of Tabriz, the commercial capital of Persia, and Russian steamers unload cargoes within 160 miles of Teheran. The result is that in North Persia Russia is the predominant commercial factor. In South Persia Great Britain, controlling the Persian Gulf, has been able, since the opening of the Suez Canal, firmly to establish its supremacy in trade. Between these two great spheres of Russian and British trade lies Middle Persia, over which both countries are endeavoring to extend their sway. The great inland centres of commerce are Tabriz, Teheran, Ispahan, and Meshhed, connected by caravan routes to which smaller routes extending to most parts of the country are tributary. Opium leads in the exports, followed by raw silk, rice, carpets, tobacco, dried fruits and nuts, wheat and barley, gum tragacanth, asafœtida, and raisins. The imports are determined by the fact that the country is deficient in many products which constitute the necessaries of civilized life. Iron is worked only in the rudest fashion, little sugar is made, the oil wells are untouched, fabrics are in limited supply, and yet Persia consumes enormous quantities of sugar, kerosene, hardware, textiles, and many other manufactures. Cotton textiles are the largest imports ($3,991,542 in 1901-02). Great Britain supplies most of the bleached and unbleached cottons. Then come silks and woolens, sugar, spices, hardware, glassware, iron, and many other commodities. The value of the imports in the fiscal year 1901-02 was $27,184,536, of which Russia sent $11,071,828; Great Britain, $10,327,900; France, $2,324,927; Turkey, $1,218,100; Austria, $995,729; Afghanistan, $261,671; Germany, $231,913; other countries, $742,465.

The value of the exports in the same period was $11,415,464. The total import and export trade was therefore worth $38,600,000, of which Russia had 56 per cent. and Great Britain 24 per cent. The sales of pearls from the great Bahrein fisheries in the Persian Gulf amounted to $2,895,000.

The principal ports are Bender Abbas, Lingah, and Bushire on the Persian Gulf, and Enzeli and Meshhed-i-Ser (the port of Balfrush) on the Caspian. Trebizond, a port of Asiatic Turkey on the Black Sea, is still an important outlet for the trade of Tabriz. In February, 1903, the new tariff agreement between Russia and Persia,

by which the ad valorem duties of 5 per cent. on both exports and imports were changed to a specific tariff, went into effect. All the other foreign Powers are included in this agreement on the 'most favored nation' basis.

TRANSPORTATION AND COMMUNICATION. The roads are very poor, the caravan routes being merely mule paths. An excellent highway 217 miles long, extending from Resht on the Caspian Sea to Teheran, built by the Russian Government, was completed in 1899. Another improved road built by British capital was completed in 1900 between Ispahan and Ahwaz, the head of navigation on the Karun River. Regular steamship lines connect the ports of the Caspian Sea with Russian ports, and the ports of the Persian Gulf with Great Britain and India. The only railroad extends from Teheran to one of the suburbs—six miles. The telegraph system extends north and south across the country and east and west across Northern Persia, with 4800 miles of line. There are about 100 post offices.

BANKING. The Imperial Bank of Persia, established in 1889 under a concession granted to Baron Reuter, has an authorized capital of £4,000,000 sterling, which, however, owing to the great fall in silver and the rise in exchange, was reduced in 1894 to an actual capital of £650,000. The bank has the exclusive right to issue bank notes, which must not exceed £800,000 unless authorized by the Persian Government. The issue of notes is on the basis of the silver kran, the coin in reserve now being 33 per cent. The head office is at Teheran and there are branches at Tabriz, Resht, Meshhed, Ispahan, Yezd, Shiraz, Bushire, and Bombay. The Russian Banque des Prêts de Perse, which is connected with the Russian State Bank, and a branch of the Russian Banque de Commerce de Moscou are also established in Teheran.

GOVERNMENT. The government is an absolute monarchy in the hands of the Shah, and resembles that of Turkey. The Shah is assisted by a ministry consisting of a Grand Vizier, and of ministers (viziers) of Foreign Affairs, Internal Affairs, Finance, War, Education, Mines and Telegraphs, Post, Justice, etc., to the number of 27. The rule of the Shah, however, is restrained in that it must accord with the "divine law" of the Mohammedan religion. Furthermore, the Imâm-Juma, not the Shah, stands at the head of the Shiah religious system, which prevails in Persia. There are 35 main political divisions, comprising five large provinces or *mamlikats* and 30 smaller provinces termed *vilayets*. The *mamlikats* and their capitals are as follows:

MAMLIKAT.	CAPITAL.
Azerbaijan.	Tabriz.
Farsistan, or Fars.	Shiraz.
Ghilan, or Gilan.	Resht.
Khorasan.	Meshhed.
Kirman.	Kirman.

Azerbaijan is the fief of the heir apparent. The governors of the other provinces are appointed by the Shah and usually hold office for one year. They have almost absolute power in their respective territories. The provinces are divided into sub-provinces, districts, subdistricts, parishes, cities, towns, and villages. These minor divisions are administered by lieutenant-governors, mayors, etc., who are appointed by the governor and are directly responsible to him. Justice is administered both by the Shah and by the clergy, according to the laws of the Koran, and is often satisfied, even in connection with the worst crimes, by payment of money to the Government. The Persians, however, have been renowned through all time for the cruelty of their punishments and their disregard of human life. Teheran is the capital.

FINANCE. The revenues and business of the country suffer from the great fluctuation in value of the silver medium of exchange. Owing to the rise in the price of silver, the value of the revenue rose in 1890-91 to £1,775,000, but the subsequent decline in the price of silver reduced the value of the revenue for 1899-1900 (estimated at less than £1,500,000). About four-fifths of the revenue is derived from assessments upon towns, villages, and districts, the rest coming from the customs, post office, telegraphs, fisheries, mines, and some other concessions. The revenues exceed the expenditures, the balance being paid into the Shah's Treasury. About one-third of the expenditures is for the army, one-tenth for the royal court, one-fifth for pensions, one-sixteenth for allowances to princes, and one-sixtieth for the Foreign Office—the civil service, colleges, and local governments absorbing most of the remainder. The debt is very small. Persia's credit is good and the Government has promptly met its foreign obligations. The only foreign debts now outstanding are a loan of $17,325,000, known as the five per cent. Persian gold loan of 1900, taken by the Russian Banque des Prêts de Perse, the loan running 75 years and guaranteed by Persian customs receipts, and a further loan of $7,700,000, granted in 1902 by the same bank on the same conditions.

ARMY. See under ARMIES.

WEIGHTS, MEASURES, AND MONEY. The kran, a silver coin, is the monetary unit. Its value, subject to great fluctuations, is about 8.2 cents. The copper coinage has been entirely replaced by large quantities of nickel 5 and 10 centimes pieces coined at Brussels and put into circulation in 1900. There are six gold coins, subdivisions or multiplications of the toman, which is nominally worth 10 krans. Very little gold is in circulation. The unit of weight is the miskal (71 grains), but most articles are bought and sold by a weight called batman or man, which varies in avoirdupois, one of the most commonly used being the man-i-Tabriz, which equals 640 miskals or 6.49 pounds. The unit of measure is the zar or gez, of which several standards are in use, the most common measuring 40.95 inches.

POPULATION. The inhabitants number over 9,000,000, the largest part of whom live in the cities and towns. Large areas are uninhabited, and the density of the population is only about 14 to the square mile. The estimated population of the principal cities is: Teheran, 250,000; Tabriz, 180,000; Ispahan, 80,000; Meshhed, 60,000; Kirman, about 40,000; Yazd, 55,000; Balfrush and Shiraz, 50,000 each. The inhabitants are divided into two distinct classes, the dwellers in towns or villages and the dwellers in tents. Many of the richer dwellers in the towns leave for the mountains during the hot summer months. The nomads, including Arabs (260,000), Kurds and Leks (675,000), Turks (720,000), Lurs (234,000), and Baluchis and Gypsies (20,700), move from place to place according as their animals need pasturage or their other interests dictate.

Religion. Nearly all the inhabitants are Mohammedans, besides whom there are about 9,000 Parsis, 35,000 Jews, 15,000 Armenians, and 25,000 Nestorians. Wide tolerance is exercised toward the followers of other religions in places where Europeans reside, but elsewhere they are sometimes oppressed by the lower classes of the population. It is an interesting fact that most of the Mohammedans in Persia belong to the Shiite or "unorthodox" sect of Islam.

Education. All wealthy families employ private tutors for their children, and many colleges supported at public expense instruct students in religion, Persian and Arabic literature, and some scientific branches. There are also many schools for children, but most of the population are taught to read only the Koran. Western languages and science have been introduced to some extent into Persia by the polytechnic school which was opened in Teheran in 1849. It has several European professors. There are military colleges at Teheran and Tabriz, and a number of schools with improved methods of teaching supported by subscription and small tuition fees are in several of the larger towns.

Ethnology. The Persians, ancient and modern, are the most numerous and the most important historically of the Iranian group of Aryan peoples. The great plateau of Iran has been occupied since the earliest historical times by peoples of Aryan stock, Medes, Proto-Medes, and ancient Persians, who played a great rôle in the development of Western Asia, produced monuments of lasting grandeur, imposed a court and a language upon nations from the Mediterranean to the Bay of Bengal, and through their literature profoundly influenced both the Orient and the Occident. They are also said to have had more or less to do with the rise of strict monotheism among the Hebrews after the captivity. The culture of the modern Persians covers a wide range, from the civilization or semi-civilization of the cities and towns to the nomadism and pastoralism of a very primitive sort prevalent in the mountainous districts. The civilization of the Persians is often spoken of as only "skin-deep," the barbarian and the savage sleeping but lightly in the garb of culture. Physically, the mass of the Persians belong to the Aryan type, although much intermixture (as the modern Persian type shows) has taken place. The pure Iranian is to be found among the Farsis about Persepolis, and among the Loris (Luris), or mountaineers, somewhat farther to the west. Of the "ideal Persian type" there are three subvarieties: (1) A darker population toward the southwest, along the line of contact with the Arabs; a Semitic strain pointing toward Africa. (2) The great mass of the Persian population—the Hajemis and Tajiks of the east and northeast—the result of a Turkoman-Tatar cross with the pure Iranian. Here belong also the Azerbaijan Tatars, Turkish in speech, but distinctly Iranian in race. (3) The Susians about the mouth of the Persian Gulf in the southeast, where a strain of Negroid blood is apparent, and relationship with the hill tribes of India is suggested. Some authorities, however, do not attribute so much importance to the 'Negroid' traits of the Susians, since they may be due to slave intermixture. With the Hajemis, whose habitat is chiefly between Teheran and Ispahan, belong the Talych, Mazanderani, and other tribes of the Caspian littoral, to whom are closely related both dialectically and otherwise the Tat and Guran of the extreme west, who are agriculturists. The Tajiks are the settled agricultural population of the greater part of Persia, as well as the stock from which many of its mercantile classes come. The same name is applied to their kindred between the Caspian, China, and India. The Tajiks are brachycephalic and above the average in height, while the Hajemis and in part the Farsis are dolichocephalic and of average stature. The Persians of the Persepolitan country are fair-skinned, slender, finely formed, and blonds by comparison with their darker neighbors. The Loris or Luris are taller, much darker, and dolichocephalic. Besides its Aryan population, Persia contains a considerable number of Turks and some few Arabs. In the extreme west Kurds (Aryans) are also to be found; likewise some Armenians, also Aryans. See Plate of Asia, Yellow Races of.

History. Although the legendary history of Persia begins some thousands of years before the Christian Era, our earliest trustworthy information is derived from the Greek writers. Herodotus, Ctesias, and Xenophon are our chief authorities, but their accounts are very conflicting. The northwestern part of Iran, anciently called Media (q.v.), was at the earliest period known to the Greeks a part of the Assyrian empire, but the Medes revolted and under Deioces established an empire which subdued both Assyria and their own kindred Persis. Herodotus states that the Persians were brought under complete subjection, but Xenophon's account implies that they were entirely independent, or at most that they recognized only a nominal allegiance to the ruling power.

The history of the Persian Empire proper begins with the revolt under Cyrus the Great about the middle of the sixth century B.C. With the defeat of Astyages, King of the Medes, the Persians gained their independence and subdued their former masters, who from this time became amalgamated with them. Cyrus continued his career of conquest, and soon succeeded in establishing a mighty empire, which extended from the Oxus and Indus to the shores of the Mediterranean. (See Cyrus.) His son, Cambyses II., a cruel tyrant (B.C. 529-522), subdued Tyre, Cyprus, and Egypt. After the brief rule of the usurper Smerdis (B.C. 522-521), Darius I., surnamed Hystaspis (B.C. 521-486), mounted the throne. He firmly established his dynasty, added Thrace and Macedonia to his empire, and suppressed a revolt of the Greek cities of Ionia; but his two attempts to subdue Greece were completely foiled, the first by the Thracians, and the second by the Athenians at Marathon (B.C. 490). One important service which he performed for the empire was the organization of the satrap system of administration. The whole empire was divided into provinces, and over each was placed a governor, or satrap, who was directly responsible to the Great King. Some uniformity in the government was thus secured, and the empire, as a whole, was very much strengthened. Darius's son, Xerxes I. (B.C. 486-466), raised the largest army that the world had ever seen for the subjugation of Greece. His military force was seconded by a great fleet. The King himself led the expedition in B.C. 480. He at first advanced successfully, but his fleet was utterly defeated at Salamis, and in B.C. 479 his army was overwhelmed at Platæa, while his

fleet sustained another great defeat at Mycale, on the coast of Asia Minor. He was now forced to act on the defensive, and thereby, despite his energy, exhausted the resources of his kingdom. His son, Artaxerxes I. (B.C. 466-425), surnamed Longimanus, was unable to stay the decadence of Persia, which had now commenced. He, however, crushed a formidable rebellion in Egypt, though his wars with the Greeks and Ionians were unsuccessful. The empire became racked by internal strife, which continued during the reigns of his successors, Xerxes II., Sogdianus, Darius II., Artaxerxes II., and Artaxerxes III. Darius III., Codomannus (B.C. 336-330), the last of the dynasty, was compelled to yield his throne to Alexander the Great, who conquered all the former provinces of Persia and founded a vast empire, which, after his death, in B.C. 323, was divided into four parts, Persia along with Syria passing to the Seleucidæ, and its old dependency, Egypt, to the Ptolemies.

The Seleucidæ soon lost Bactria, which became independent under a series of Greek sovereigns; and about B.C. 246 Parthia also rebelled under Arsaces I., who founded the dynasty of the Arsacidæ, by whom the greater part of Persia was wrested from the Greeks, and defended alike against the Greeks and Romans. The Greek empire of Bactria, which included part of Northern Hindustan, was overthrown by nomads from Turkestan. The Parthians drove these invaders out and added Bactria to their empire. The dynasty of the Arsacidæ was brought to an end about A.D. 226 by a Persian named Ardashir (q.v.), the founder of the dynasty of the Sassanidæ (q.v.).

The Sassanian kings raised Persia to a great height of power and prosperity, and more than once they imperiled the Byzantine Empire. The greatest of these monarchs were Khosru (Chosroes) I. (531-579) and Khosru II. (590-628). Soon after the death of Khosru II. the Persian monarchy was engulfed in the tide of Saracen conquest. The victories of Cadesia (c.635) and of Nehavend (c.642) made the Arabs masters of the kingdom. During the reigns of Omar (the first of the Arab rulers of Persia), Othman, Ali, and the Ommiads (to 750), Persia was ruled by deputy governors; but on the accession of the Abbassides (A.D. 750), Bagdad became their capital, and Khorasan their favorite province, and Persia consequently was regarded as the centre of the caliphate. But their rule soon became a nominal one, and ambitious governors established independent principalities in various parts of the country. Many of these dynasties were short-lived, but others lasted for a considerable period and represented powerful empires. The chief were the Taherites (820-872), in Khorasan; the Soffarides (869-903), in Seistan, Fars, Irak, and Mazanderan; the Samani, in Transoxiana, Khorasan, and Seistan; the Dilemi (933-1056), in Western Persia, and the Ghaznevides (q.v.), in Eastern Persia.

This series of dynasties was ended by the Seljuks (q.v.), whose dominion extended from the Hellespont to Afghanistan. A branch of this dynasty, which ruled in Khwaresm (see KHIVA), gradually acquired the greater part of Persia, driving out the Ghaznevides and their successors, the Ghurides (see GHURI); but, together with the petty dynasties which had established themselves in the southwestern provinces, they were swept away by the Mongols under Genghis Khan (q.v.) and his grandson, Hulagu Khan, the latter the founder of a new dynasty, the Perso-Mongol (1253-1335). This was supplanted by the Il-khans in 1335, but an inroad of the Tatars under Timur (q.v.) again freed Persia from the petty dynasties which misruled it. After the death of Timur's son and successor, Shah Rukh, the Turkomans took possession of the western part of the country, while the eastern portion was divided among Timur's descendants, until, at the close of the fifteenth century, the Uzbeks (q.v.) added all Eastern Persia to their new Khanate of Khiva.

In 1500 a new dynasty arose in Western Persia. Ismail, the first prince of this line, became the leader of a number of Turkish tribes, overthrew the Turkomans, and seized Azerbaijan, which was the seat of their power. He quickly subdued the western provinces, and in 1511 took Khorasan and Balkh from the Uzbeks; but in 1514 he had to encounter a much more formidable enemy in Selim I. (q.v.), the Sultan of Turkey. The Persians were totally defeated in a battle on the frontiers; but after his retreat Ismail attacked and subdued Georgia. His son, Tamasp (1523-76), a prudent and spirited ruler, repeatedly drove out the Uzbeks from Khorasan, defeated the Turks, and assisted Humayun, the son of Baber, to regain the throne of Delhi. After a period of upheaval, during which the Turks and Uzbeks attacked the empire, Shah Abbas I., the Great (1585-1628), ascended the throne, restored tranquillity, and repelled the invaders. In 1605 he inflicted on the Turks a defeat which enabled him to recover the whole of Kurdistan, Mosul, and Diarbekir, which had for a long time been separated from Persia; while in the east Kandahar was taken from the Great Mogul. The government of Abbas was strict but just. He constructed at immense expense roads, bridges, caravansaries, and other conveniences for trade, and, with a tolerance unusual in a Mohammedan, he encouraged the Armenian Christians to settle in the country, knowing that their industry would help to advance the prosperity of his kingdom. His successors, Shah Sufi (1628-41), Shah Abbas II. (1641-66), and Shah Sulaiman (1666-94), were undistinguished by any remarkable talents, although the two former were sensible and judicious rulers, and advanced the prosperity of their subjects. During the reign of Sultan Hussein (1694-1722) priests and slaves were elevated to the most important offices of the empire, and religious persecution ran riot. The consequence was a general discontent, of which the Afghans took advantage by declaring their independence and seizing Kandahar (1709). Their leader, Mir Vais, died in 1715, but one of his successors, Mahmud, invaded Persia (1722), defeated Hussein's armies, and besieged the Sultan in Ispahan. Hussein then abdicated the throne in favor of Mahmud, who, on his accession, immediately devoted his energies to gaining the confidence of his new subjects. He became insane and was deposed in 1725 by his brother Ashraf (1725-29), but the latter's tyranny was ended by Nadir Shah (q.v.), who raised first Tamasp (1729-32), and then his son, Abbas II. (1732-36), of the Sefevid race, to the throne. Not content with the nominal rule, Nadir Shah found a pretext to depose Abbas, and seized the sceptre (1736-47). On his death anarchy reigned; the

country was devastated by the rival claimants for the throne; Afghanistan and Beluchistan finally separated from Persia, and the country was divided into a number of small independent States till 1755, when a Kurd named Kerim-khan (1755-79) reëstablished unity in Western Persia, and by his wisdom, justice, and valor gained the esteem of his subjects and the respect of neighboring States. After a period of anarchy Lutf Ali ascended the throne in 1789, but was attacked by Agha Mohammed, a eunuch of the Kajar race, who had set up an independent principality in Mazanderan. Agha Mohammed triumphed in 1795, becoming the founder of the present dynasty. On his accession he announced his intention of regaining what had been lost since the reign of Kerimkhan, and accordingly invaded Khorasan and Georgia, subduing the former country almost without effort. The Georgians, however, besought the aid of Russia, but Agha Mohammed at once marched his army into the country and devastated it with fire and sword; his conquest was, however, hardly completed when he was assassinated, May 14, 1797. His nephew, Futteh Ali (1797-1834), succeeded him, and after a period of conflict succeeded in fully establishing his authority. He completely subdued the rebellious tribes in Khorasan, but was involved in a war with Russia soon after his accession, and by a treaty concluded in 1797 was forced to surrender Derbend and several districts on the Kur.

In 1801 Georgia was declared to be a Russian province. War with Russia was recommenced by Persia, at the instigation of France, and, after two years of disaster, Futteh Ali by the Treaty of Gulistan (Oct. 12, 1813) ceded to Russia Daghestan, Shirvan, Baku, etc., and granted her the right of navigation in the Caspian Sea. In 1826 a third Russian war broke out, equally unfortunate for Persia, which in the Treaty of Turkmantchai (1828) had to surrender the bulk of Persian Armenia and pay a war indemnity of 18,000,000 rubles. The severe taxation necessary to pay this sum so exasperated the people that they rose in insurrection (Oct. 12, 1829), and murdered the Russian Ambassador, his wife, and almost all the Russian legation. The most humiliating concessions, and the mutilation of 1500 of the rioters, alone averted war. The death of the Crown Prince, Abbas Mirza, in 1833, seemed to give the final blow to the declining fortunes of Persia, for he was the only man who seriously attempted to raise his country from its abasement. By the assistance of Russia and Great Britain, Mohammed Shah (1834-48), the son of Abbas Mirza, obtained the crown. He resolved to extend the Persian dominions to the Afghan, Baluch, and Khivan boundaries, but an attempt which he made to reannex Herat was resisted by England. The war was terminated in 1838 by the landing of a small Sepoy force on the shores of the Persian Gulf.

Nasr-ed-Din succeeded to the throne on his father's death in 1848, and the new Government announced energetic reforms, but failed completely in carrying them out. Following his father's example, the new Shah resolved to reassert his claims in Afghanistan and Baluchistan. The ruler of Herat having recognized the claims of Persia, the English Government remonstrated with the Shah, and he was compelled to sign an agreement on Jan. 25, 1853, by which he bound himself not to interfere further in the internal affairs of Herat. In October, 1856, however, on the pretext that Dost Mohammed, the Ameer of Kabul, was about to invade Herat, the Persians again took the city of Herat. In consequence of this violation of the terms of the treaty with Great Britain, war was declared against Persia, and a British army was landed on the coast of the Persian Gulf, which, under generals Outram and Havelock, repeatedly defeated the Persians and compelled them to restore Herat (July, 1857). In 1868 the Persians occupied Seistan, a province claimed by the Afghans, and extended their jurisdiction over the western third of Baluchistan. To put an end to this incessant strife, the Persians at length agreed with the Ameer of Afghanistan and the Khan of Khelat to refer the questions in dispute to an English commissioner. Sir Frederick Goldsmid accordingly visited the eastern frontier of Persia, and in 1872 delivered his award. It carried the Baluch frontier from 58° to 63° east longitude, so as to include in Persia the inland town of Jalk, and Guadar on the Indian Ocean. In 1870 the Russians granted the extension of the jurisdiction of Persia over the whole basin of the Atrek. In 1873 Nasr-ed-Din visited several of the European courts; in 1878 he visited Russia; and in 1889 he again made a tour of Europe. As a ruler he was energetic and severe. His policy was largely under the influence of the Russian Court, though for a time after the failure of his attempt to restore the Persian dominion over Herat he maintained a somewhat friendly attitude toward Great Britain. He sternly repressed revolts and conspiracies, but, through the sale of the tobacco monopoly to English speculators, he offended many of his subjects, and his unpopularity was increased by the scarcity of food in several of the provinces in subsequent years. In 1896 a *mollah*, an adherent of a seditious sect, who had been banished from Persia in 1891, shot and killed the Shah while the latter was entering a shrine near Teheran. His son, Muzaffer-ed-Din, was proclaimed Shah in the following month.

The new Shah reduced the taxes on food, proclaimed that public office should henceforth be awarded on merit and without consideration of money, and declared that he would rule without a Grand Vizier, assuming himself the presidency of the Cabinet of twelve ministers. In 1900 he made a visit to Europe and was entertained in nearly all of the Continental capitals, although the death of the Duke of Coburg prevented him from going to England. While driving from Paris to Sèvres on the 2d of August he narrowly escaped assassination at the hands of an anarchist by the name of Salson. The chief feature of his reign has been the attempt of Russia to extend her influence over the country. Very much the same tactics have been employed as in Manchuria. Russian consuls have been appointed in nearly all of the larger towns, railroad franchises have been seized, extensive loans have been made to the Government, and the number of Russian troops on the frontier has been increased. In the face of these efforts the British have been playing a losing game. The Russian Government is especially anxious to secure a post on the Persian Gulf. With this end in view, a subsidized line of steamships was established in February, 1901, between Odessa and the Persian Gulf.

Bibliography. General: Descriptive. Spiegel, *Eran, das Land zwischen Indus und Tigris* (Berlin, 1863); id., *Eranische Alterthumskunde* (Leipzig, 1871-78); Dieulafoy, *La Perse, la Chaldée et la Susiane* (Paris, 1886); Wills, *The Land of the Lion and Sun; or, Modern Persia* (London, 1883); id., *Persia as It Is* (ib., 1886); Benjamin, *Persia and the Persians* (Boston, 1887); Bassett, *Persia, the Land of the Imams* (London, 1887); Wilson, *Handbook for Asia Minor, Transcaucasia, Persia, etc.* (ib., 1895); Gordon, *Persia Revisited, 1895* (ib., 1896); Knanishu, *About Persia and Its People* (Rock Island, 1899); Sykes, *Ten Thousand Miles in Persia* (London, 1902).

Travel: Exploration. Arnold, *Through Persia by Caravan* (London, 1876); Layard, *Early Adventures in Persia* (ib., 1887); Bishop, *Journeys in Persia and Kurdistan* (ib., 1893); Harris, *From Batûm to Baghdad* (ib., 1896); Weeks, *From the Black Sea Through Persia and India* (ib., 1896); Collins, *In the Kingdom of the Shah* (ib., 1896); Kauder, *Reisebilder aus Persien, Turkestan und der Turkei* (Breslau, 1900); Yate, *Khurasan and Sistan* (Edinburgh, 1900); Landor, *Across Coveted Lands* (New York, 1903).

Ethnology. Dumousset, *Les populations de la Perse* (Paris, 1859); Khanikoff, *Mémoires sur l'ethnographie de la Perse* (Paris, 1866); Houssay, *Les peuples actuels de la Perse* (Lyons, 1888); Preilberg, *Persien, eine historische Landschaft* (Leipzig, 1891); Schiaparelli, *Sull' etnografia della Persia antica anteriore alle invasioni ariane* (Torino, 1888); Gayet, *L'art persan* (Paris, 1895); Isfahani, *Anglo-Persian Idioms* (Cambay, 1896); Falk, *Persien, folk och stat* (Stockholm, 1899); Wilson, *Persian Life and Customs* (London, 1896); Ripley, *Races of Europe* (New York, 1899); Ratzel, *History of Mankind* (London, 1898).

History. Malcolm, *History of Persia* (2d ed., London, 1829); Bridges, *The Dynasty of the Kayars*, (ib., 1838); Barbier de Meynard, *Dictionnaire géographique, historique et littéraire de la Perse* (Paris, 1861); Watson, *A History of Persia from the Beginning of the Nineteenth Century* (London, 1873), a continuation of Malcom's history; Spiegel, *Eranische Alterthumskunde* (Leipzig, 1871-73); Piggot, *Persia, Ancient and Modern* (London, 1874); Markham, *A General Sketch of the History of Persia* (ib., 1874); Justi, *Geschichte des alten Persiens* (Berlin, 1879); Nöldeke, *Aufsätze zur persischen Geschichte* (Leipzig, 1887); Gutschmied, *Geschichte Irans und seiner Nachbarländer* (Tübingen, 1888); Justi, "Geschichte Irans von den ältesten Zeiten bis zum Ausgang der Sasaniden," and Horn, "Geschichte Irans in islamitischer Zeit," in Geiger and Kuhn, *Grundriss der iranischen Philologie*, vol. ii. (Strassburg, 1897-1900); E. Meyer, *Geschichte des Alterthums*, vol. i., *Das Perserreich und die Griechen* (Stuttgart, 1901). Other important works are: Polak, *Persien, das Land und seine Bewohner* (Leipzig, 1865); Markham, *Eastern Persia: an Account of the Journeys of the Persian Boundary Commission, 1870-72* (London, 1876); Stoltze and Andreas, *Die Handelsverhältnisse Persiens* (Gotha, 1885); Curzon, *Persia and the Persian Question* (London, 1892); De Morgan, *Mission scientifique en Perse* (Paris, 1894-96); Fenvrier, *Trois ans à la cour de Perse* (Paris, 1899).

PERSIAN ART. The history of Persian art falls into two main divisions: that before and that after the advent of Mohammedanism. In the earliest period the civilization and art bore a great resemblance to the Babylonian and Elamite. The palaces, rock-cut sculptures, and images of gods closely resembled those of neighboring nations. These monuments, however, at Susa and elsewhere, were swept away by the invasion of the Iranian tribes toward the eighth century B.C., in their two divisions of Medes and Persians.

Medes and Persians. Ecbatana and Pasargadæ and the rock-cut altars on several mountain summits show that the new art was quite different from the old. It had no temples, only altars in the open air, with some slight protection. Its palaces, as indicated by Polybius's description of that of Cyaxares at Ecbatana, were built of wood covered with metal, brilliant and light, a great contrast to the heavy brick architecture of the Babylonians. The conquests of Cyrus and his successors led to radical modifications; the architectural features, sculptural and decorative methods, were adopted from Lydia and the rest of Asia Minor and from Egypt: stone replaced wood and metal; sculpture in relief, in stone and glazed tiles, was copied, both in style and subject, from Babylonia and Assyria, and thus we find sporadic resemblances even to archaic Ionian Greek art, due to borrowing from a common source. But the Persians adhered to their open-air architecture, to their large, light palace halls, amid all these transformations.

A most original compound, the keynote to this style, is what is termed the Persepolitan column, found also in great perfection at Susa. It is extremely slender, its height being thirteen times its diameter, and has numerous channelings. It was also far more widely spaced than the Egyptian, as it supported a wood instead of a stone superstructure—a feature Hellenic and not Egyptian. Its capital is the most complicated devised in the history of ancient architecture, being usually in three superposed stories, the lower taken from Egypt, the middle from Assyria, the upper being two bulls back to back. These columns appear to have supported wooden beams, an idea also borrowed, apparently, from the Greeks. The size and magnificence of the monuments increased with the expansion of the empire, but, after culminating under Darius (see Persepolis), had been waning for over a century when Alexander conquered Persia.

The Parthians and Sassanians. In vain the Hellenistic art of the period succeeding Alexander sought under the Seleucidæ to impose its yoke on these provinces. There is almost a blank until national existence was revived under the Parthian dynasty of the Arsacidæ. Even then art did not rise above mediocrity, for the dominant race was not artistic. The palace of Hatra, attributed to them, shows the heavy walls, small chambers and vaults of Assyro-Babylonian art, but the material is stone and the ornamentation shows Greek influence. Under the Sassanians a real artistic renaissance took place, almost thoroughly Oriental, which lasted until the Arab conquest in the seventh century A.D. Earliest of all come the domed palaces of Fars and Sarvistan; then that of Firuzabad, and finally those of Ctesiphon and Mashita, with characteristic Iranian elliptic domes and partial return to Babylo-

nian [illegible]rk in place of Hellenic stone. Finally, as a transition to Byzantine art, already heralded at Mashita, with its wealth of decoration, come the palaces of Rabbath-Ammon and Eivan. This Sassanian art had many forms that are now destroyed. Its hangings and its rugs were doubtless models for mediæval workmen. Of its goldsmith work the silver cup of Khosru in Paris is a magnificent example, with clear lines and crisp details, influenced by the barbaric Greek school of the Black Sea and the Bosporus. Coins and medals, ivories and cut gems, all show this mixture of influences.

Mohammedan Persia. Two centuries after the Mohammedan conquest Persia not only recovered its artistic supremacy, but enlarged its influence by dominating the Caliphate of Bagdad. But of this period almost nothing remains. Persia was then overrun by Tatars and Mongols, whose influence modified the purer native Mohammedanism. Persian art retained the dome and the broad arch—like the old Sassanian ellipse—and threw itself more and more into color and decoration. It was the only Mohammedan school consistently to allow the use of the human figure in design—in wall paintings and illuminations, in metal sculpture and textiles. This school radiated into India, and influenced all other Islamic schools, such as the Syrian, Spanish, and even, though slightly, the Egyptian. The collapse of the caliphate and the hordes of Genghis Khan and Tamerlane wiped out most of the really mediæval work, and we must judge of it from the better-preserved and more gorgeous if less pure works of the Persian renaissance of the fifteenth and sixteenth centuries, its last period of brilliancy. Even in modern times Persian art has retained its character and influence, its beauty of color and design, while other Eastern schools have died out, and it has not been without effect even in raising the standard of taste in Europe and America, especially by its rugs and hangings. Consult: Dieulafoy, *L'Art antique de la Perse* (Paris, 1884); Perrot and Chipiez, *Histoire de l'art dans l'antiquité*, vol. v. (ib., 1890); Gayet, *L'Art persan* (ib., 1895); Coste, *Monuments modernes de la Perse* (ib., 1867); Sarre, *Denkmäler persischer Baukunst* (Berlin, 1901). See Ecbatana; Mohammedan Art; Pasargadæ; Persepolis; Susa.

PERSIAN GULF. An arm of the Arabian Sea, almost land-locked between the southwestern coast of Persia and the Arabian Peninsula (Map: Persia, D 7). It is entered from the Gulf of Oman, a northwestern arm of the Arabian Sea, through the Strait of Ormuz, 30 to 60 miles wide, and stretches from southeast to northwest, with a length of 520 miles and a breadth of 150 to 200 miles. Its area is about 90,000 square miles, including 1400 square miles of islands, which are generally barren and desolate. The most important islands are Ormazd, Kishm, and the Bahrein Islands (qq.v.), the last being noted for their important pearl fisheries. The coasts, which are mostly of limestone formation, are high and steep on the Persian, but low and sandy on the Arabian side. The gulf is, as a whole, shallow, being nowhere more than 300 feet deep, and having shoals and banks in many places. The only considerable river entering the gulf is the Shat-el-Arab—the combined waters of the Euphrates and the Tigris.

PERSIAN LANGUAGE. The modern Iranian language of Persia. The earliest authentic specimens are found in the fragments of Handhala of Badghis in the first half of the ninth century, and of Abbas of Merv (A.D. 809). Closely connected with the Middle Persian or Pahlavi (q.v.) and with Old Persian (q.v.), modern Persian has undergone scarcely any change from the time of Abbas and Firdausi (q.v.) to the present day. In structure the language is analytic, like English. It is indeed possible to trace a certain analogue between the development of the two tongues. As English has become an analytic language as compared with Anglo-Saxon, so Persian is analytic while Old Persian is highly inflected. Again, as English received through the Norman Conquest the Romance and Latin elements, Persian was enriched with a large vocabulary of Arabic loan-words by the Mohammedan invasions. On the other hand, it is considered inelegant in English to overload one's style with Latinisms, while in Persian stylistic charm is in direct proportion to the Arabisms employed. The phonological deviations of modern from ancient Persian are comparatively few. The principal ones are as follows: Old Persian *ai* becomes New Persian *ē*, *ī*, as Old Pers. *Haraiva*, New Pers. *Harē*, *Harī*, 'Herat;' Old Persian *au* becomes New Persian *ō*, *ū*, as Old Pers. *raučah*, New Pers. *rōz*, *rūz*, 'day;' initial Old Persian *y* becomes New Persian *j*, as Old Pers. *yauviyā*, New Pers. *jōi*, *jō*, *jū*, 'canal;' initial Old Persian *v* becomes New Persian *b* before *a*, *ā*, *ē*, *ī*, *iy*, but *g* before *u*, as Old Pers. *vasiy*, New Pers. *bas*, 'much,' but Old Pers. *viyatarayāma*, 'we crossed,' New Pers. *guδaštan*, 'to pass over;' Old Persian *f*, *d*, *θ*, sometimes becomes New Persian *h*, as Old Pers. *kaufa*, New Pers. *kōh*, *kūh*, 'hill,' Old Pers. *dadātuv*, 'let him give,' New Pers. *diham*, 'I give,' Old Pers. *gāθʻu* New Pers. *gāh*, 'place'; but initial Iranian *s*, which sometimes appears as *θ* in Old Persian, is retained as *s* in New Persian, as Old Pers. *θuxra*, Avesta *suxra*, New Pers. *surx*, 'red;' Old Persian surds between vowels and after *r* or *n* become sonants in New Persian, as Old Pers. *xšapan*, New Pers. *šab*, 'night,' Old Pers. *pitar*, New Pers. *pidar*, *piδar*, 'father.' Old Pers. *Varkāna*, 'Hyrcania,' New Pers. *gurg*, 'wolf.' The accent in modern Persian falls in general on the last syllable of the word. The preterite tense of the verb, except in the third person singular, however, keeps the accent of the stem, as *āfarīdam*, 'I created.' In the New Persian noun there is neither gender nor, properly speaking, case. The plural, however, distinguishes to some extent between animate and inanimate, as *gāvān*, 'cattle,' but *jāmahā*, 'clothes.' The plural ending *-ān*, which is now usurped in colloquial speech by *-hā*, is the old genitive plural, as Av. *xšafnąm*, 'of the nights,' New Pers. *šabān*, 'nights.' The genitive and adjective relations are denoted by *i* (called by the Arabic term *izāfat*, 'annexation') placed between the governing word and the following genitive, and between the noun and the following adjective, as *raftan-i laškar*, 'departure of the army,' *āb-i pāk*, 'pure water.' This *i* is derived from the similar use of *hya* in Old Persian and *yaṯ* in Avesta, as Old Persian *kāra hya manā*, 'my army' (literally, 'army that of me'), *kāra hya Bābiruviya*, 'Babylonian army' (literally, 'army that Babylonian'), Avesta *ašahe yaṯ vahištahe*, 'of best

righteousness' (literally, 'of righteousness that the best'). The dative, especially in the older poetry, is frequently expressed by an appended *rā*, as *pidar-rā guftam*, 'I said to the father.' This *rā* is the survival of the same use of *rādiy*, 'for the sake of,' in Old Persian, as *avahya rādiy*, 'on account of this.' Adjectives are compared by adding *-tar* for the comparative, and *-tarīn* for the superlative, as *buzurk*, 'high,' *buzurktar*, *buzurktarīn*. The verb in Persian is extremely simple. It has three persons, two numbers, an indicative, imperative, and (rarely) a precative, an infinitive, a present (active) and past (passive) participle, and a gerundive. The tenses of the indicative are the preterite, corresponding in force to the Greek aorist; imperfect (formed by prefixing *mī* or *hamī* to the preterite), corresponding to the Greek imperfect; aorist, corresponding to the Latin indefinite present; present (formed by prefixing *mī* or *hamī* to the aorist); and future (formed by prefixing *bi* to the aorist). The passive is formed by the past participle with auxiliary *šudan*, 'to be,' as *pursidah šudan*, 'to be asked,' while active periphrastic tenses are formed by the participles and the infinitive with the verbs *ast*, etc., 'he is,' *būdan*, 'to be,' *xᵛ āstan*, 'to wish.'

The dialects of Persian are both numerous and, especially from a linguistic point of view, important. They are divided into three groups, the Pamir, Caspian, and Central. The Pamir dialects are Wakhi, Shighni, Sarikoli, Roshani, Tajiki, Sanglici, Minjani or Mungi, Yidghah, and Yaghnobi. The Caspian group includes Samnani, Mazanderani, Lahijani, Gilaki, Talishi, and Tat or Judæo-Persian. The Central dialects embrace Gabri, Shirazi, Bahbahani, Sivandi, Yazdi, Zafrahi, Kashahi, Vonishuni, Kuhrudi, Nayini, Natanzi, and Kashani. But few of these dialects have as yet received any literary culture.

Consult: Ibrahim, *Grammar of the Persian Language* (London, 1843); Vullers, *Institutiones Linguæ Persicæ* (2d ed., Giessen, 1870); Wahrmundt, *Praktisches Handbuch der neu-persischen Sprache* (ib., 1875); Darmesteter, *Études iraniennes*, vol. i. (Paris, 1882); Chodzko, *Grammaire de la langue persane* (ib., 1883); Salemann and Shukovski, *Persische Grammatik* (Berlin, 1889); Horn, *Grundriss der neupersischen Etymologie* (Strassburg, 1893); Hübschmann, *Persische Studien* (ib., 1895); Platts, *Grammar of the Persian Language* (London, 1894); Kanga, *Hints on the Study of Persian* (Bombay, 1895); Huart, *Grammaire élémentaire de la langue persane* (Paris, 1889); Mirza-Jafar and Korsh, *Grammatika persidskoya yazyka* (Moscow, 1901); St. Clair-Tisdall, *Modern Persian Conversation-Grammar* (London, 1902); Horn, "Neupersische Schriftsprache," and Geiger, "Kleinere Dialekte und Dialektgruppen," in Giger and Kuhn, *Grundriss der iranischen Philologie*, vol. i., part ii. (Strassburg, 1898-1901); Gray, *Indo-Iranian Phonology* (New York, 1902); Richardson, *Dictionary: Persian, Arabic, and English* (London, 1829); Vullers, *Lexicon Persico-Latinum Etymologicum* (Bonn, 1855-67); Bergé, *Dictionnaire persan-français* (Leipzig, 1868); Steingass, *Persian-English Dictionary* (London, no date); Wollaston, *Complete English-Persian Dictionary* (ib., 1894).

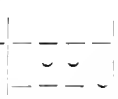
PERSIAN LITERATURE. The literature of Persia is, strictly speaking, divided into three great periods, old, middle, and new. In view, however, of the wide distinctions in chronology, language, and spirit, the Old Iranian literature, including the Avesta (q.v.) and the Old Persian inscriptions (see OLD PERSIAN), as well as the Middle Persian or Pahlavi (q.v.), may best be treated separately. The literature which began shortly after the Mohammedan conquest of Persia is that which is usually implied by the term Persian literature. It is for the most part in verse, although prose is by no means lacking. The genius of the poetry of Persia lies in the ability to say old things in a new way. Perfection of form and euphony of phraseology are the marks of the Persian poet rather than lofty thought and sincere inspiration, while originality of theme is supplanted by fertility of conceits. The poetry is, consequently, so essentially different from that of the Occident that it is somewhat difficult for a Western reader to become interested in Persian verse unless he can habituate himself to the somewhat artificial poetic atmosphere to which he is transported. This artificiality, which to the Occidental mind is a defect, is to the Oriental a proof of genius. Nor is this view unreasonable. The freedom of the West has never existed in Persia. Crushed by a despotism, hampered by Mohammedanism, and circumscribed by social conditions, only a small range of subjects has been left open for the Persian poet. Striving to make the best of his material, he has been driven to elaboration rather than creation. The monotony which wearies the Westerner, whose meagre vocabulary cannot match the luxuriousness of synonyms and rhymes found in Persian, does not exist in the original. There the music of the verse and the dexterity of the turns of thought conceal the poverty of idea, and give a pleasure which is real and justifiable.

The first Persian poetry of which any extensive remains have survived was epic, with the general metrical scheme, read from right to left, ⏑ – | ⏑ – | ⏑ – | ⏑ –. Here belong the fragments of a translation by Rudagi (tenth century) of Bidpai (q.v.). To judge from these fragments, his style was simple and free from trivial conceits. The Persian literary historians term him the Sultan of bards, and regard him as the first classical poet. About this period flourished Kisa'i, Khabbaz, Abu'l Abbas, Khusrawani, and Umara. When the Samanid dynasty fell before the attack of Mahmud of Ghazni, the conqueror gathered at his court the poets and philosophers of the time. Of them the laureate was Unsuri, the author of an epic entitled *Wāmik u 'Adhrā*, of which a few verses are preserved in Asadi's rhyming dictionary, and the composer of a long series of eulogies on his patron. Greater than he, however, was his rival, Farrukhi, a master of description, although artificial and Arabized, who bent his energies, like Anvari, Khakani, and others, to eulogies of Mahmud. To this period also belongs Daqiqi, who began the task of composing an epic on the legends of ancient Iran. The work of Daqiqi, amounting, according to tradition, to about a thousand couplets, was incorporated after his death into the greatest of all Persian epics and one of the masterpieces of world-literature, the

Shāhnāmah, or Book of Kings of Firdausi (q.v.). Of the epic poets who immediately followed Firdausi but two names have survived. The first of these is Ali ibn Ahmad al-Asadi at-Tusi, of the eleventh century (generally, but perhaps erroneously, supposed to be the same as the lexicographer Asadi), the author of the *Garshāspnāmah*, wherein he recounts in between nine and ten thousand couplets the deeds of Garshasp (a mutilation of the Avesta name *Keresāspa*), the grandfather, according to some traditions, of the legendary Iranian hero Rustam. The second is the *Sahriyārnāmah* of Mukhtari (died 1149 or 1159), who wrote of the adventures of Shahryar, the great-uncle of Rustam. Of this poem, the scene of which is in great part laid in India, but a few fragments remain. The other epics of this legendary cycle are anonymous. Of these probably the most important is the *Sāmnāmah*, which almost equals in length the *Shāhnāmah* itself, and contains the adventures of Sam, according to the Avesta the grandfather of Keresaspa; and still longer is the *Barzūnāmah*, which, like the comparatively short *Jahāngīrnāmah*, the *Farāmurznāmah*, and the *Bānū Gushāspnāmah*, also forms a part of the Rustam style. The legendary epic yielded, however, to the historical. Here it was the story of Alexander the Great, augmented by myths, which gave the first impulse. The poets Nizami, Amir Khusru, and Jami, from the twelfth to the fifteenth century, each wrote an *Iskandarnāmah*. This series was followed by a long line of epics, in many instances hardly more than rhymed chronicles, of comparatively little poetic worth. It will be sufficient here to name as the most important Ahmad Tabrizi's *Shāhanshāhnāmah* on Genghis Khan and his successors until 1338, Abdullah Hatifi's (died 1521) *Timūrnāmah* on Tamerlane, and the long *Jārjīnāmah*, or Book of George, by Mulla Firuz ibn Ka'us, celebrating the English conquest of India up to the fall of Poona in 1817. Side by side with the legendary and historical epic the romantic epopee was developed. Firdausi himself had set the example in his *Yūsuf u Zulikhā*, based on the story of Joseph and Potiphar's wife. The type of the romantic epic is conventional. The lovers become enamored of each other through a dream or a description, and the interest then centres about their constancy and their trials. The hero and heroine are either Iranian, as in the twenty-one epics on the loves of the Sassanian Khusru, his wife, the fair Armenian Shirin, and her lover, Ferhad, the sculptor, and the ten versions of Behram Gor's seven (or eight) love-adventures; or they are borrowed from the Arabs, as the fourteen poems on Joseph and Zalikha, the seven on Wamik and Adhra, and the eighteen on Laila and Majnun. After Firdausi the first great poet in this genre whose work survives was Fakh ed-Din of Gurgan (born about 1048). His poem, the *Wīs u Rāmīn*, in about nine thousand couplets, relates the love of Wis, the young wife of the aged King Mobad of Merv, for his brother Ramin. The point of the epic, which has many old Iranian elements, lies in the repeated deception of the doting monarch, and it is marked by a humor which is piquant even if unethical. A far greater romantic epic poet than Fakh ed-Din was Nizami (died c.1203), who wrote poems on three of the favorite themes already noted, the loves of Laila and Majnun, of Khusru and Shirin, and of Behram Gor. These works, together with his historical epic, the *Iskandarnāmah*, and his mystical poem, the *Makhzan-ul-asrār*, or Treasury of Mysteries, made a *khamsah*, or pentade, which was imitated by many poets. (See NIZAMI.) Nizami thus became the model for the romantic epopee in Persia. Of his successors the most important was Jami (1414-92) (q.v.), whose *Yūsuf u Zulikhā* and *Lailā u Majnūn* are not inferior to the corresponding poems of Firdausi and Nizami. Khwaja Kirmani (1281-1352) returned to the legendary epic in his *Humāi u Humāyūn*, which describes the love of Humai, son of the mythical Iranian hero Hushang (the Haoshanha of the Avesta), for Humayun, Princess of China, and a similar story is told in the same poet's *Gul u Nauruz*, on the wooing of Gul, the Princess of Rome (i.e. Byzantium), by Nauruz, Prince of Khorasan. On the other hand, Amir Khusru (1253-1325) wrote a romantic epic of his own time, entitled *Duvalrānī Khidrkhān*, on the tragic loves of the Persian Prince Khidrkhan and Duvalrani, Princess of Gujarat. The multitude of minor poets in this genre may be passed over. A noteworthy modification of the romantic epic, however, deserves mention. This is the mystical romance. Katibi (died about 1434) in his *Majma' al-Bahrain*, or Union of the Two Seas, also called *Nāzir u Manzūr*, or Seer and Seen, set forth in Sufiistic diction (see SUFIISM) the mutual love of God and man, while Jami treated the same theme in his poem on the loves of Salaman and Absal. Here too belong, together with many others, the *Gūi u Caugān*, or Ball and Mallet (also called *Hābnāmah*, or Book of Ecstasy) of Ariti (1438), and the *Shāh u Gadā*, or King and Dervish, of Hilali (died 1532).

From the epic one turns to the lyric poetry. Here the verse-schemes are for the most part borrowed from the Arabs, although the *rubā'ī*, or quatrain, is distinctly Persian in origin. The principal lyric forms are five in number, and are as follows: (1) The kassida (from Arabic *qasada*, 'to break') is employed chiefly in eulogies. It consists of at least twelve and at most ninety-nine couplets (*bait*), the second lines of which must rhyme with the first two lines (*matla'*), thus giving the rhyme-scheme *aa*, *ba*, *ca*, *da*, etc. The thought in each *bait* must be complete in itself, but need not be inseparably connected either with the preceding or following couplet. To employ the Persian figure, the rhyme is the thread on which the pearls of the *baits* are strung. The frequent change of order of distichs which is found in Persian manuscripts of lyric poetry thus becomes easily explicable. (2) The ghazal (from Arabic *ghazala*, 'to be abundant') is identical in form with the kassida, but can have no more than twelve couplets, the last of which must contain the name of the poet. This verse is devoted especially to poems on love and wine. (3) The kit'a (from Arabic *qata'a*, 'to cut off') is the same as the kassida, excepting that the matla is lacking. Its rhyme-scheme is accordingly *ab*, *cb*, *db*, *eb*, etc. (4) The mathnawi (from Arabic *thanaya*, 'to fold') is a long poem of epic, mystic, or didactic content, with each *bait* or couplet rhyming, *aa*, *bb*, *cc*, *dd*, etc. (5) The ruba'i, or quatrain (from Arabic *raba'a*, 'four'), is preëminently the Persian form of epi-

gram. Its metrical scheme, read from right to left, is:



and its rhyme is either *aaaa*, or *aaba*.

In general the Persian lyric differs from the epic only in those restrictions which the external form lays upon it. The spirit is practically the same. It is, of course, natural that the personal element should enter into the lyric far more than into the epic, and that we should find in its briefer compass a sublimation, as it were, of the conceits and mannerisms, which are more scattered in the epic. The lyric poetry of Persia may be divided into the lyric proper, the religious and didactic, and the Court poetry. In the first division love is the predominating *motif*, and the theme of next importance is wine. Into the purely subjective lyric, such as is familiar in modern Occidental poetry, the Persian does not enter. The love which is celebrated is either happy, or, in the great majority of verses, blighted by the cruelty of, or separation from, the beloved. The poet rings countless changes on this single theme. He sighs for the curl and the mole, the sugar lip and the cypress form of the object of his devotion. In nearly every instance the love set forth is, at least superficially and exoterically considered, sensuous. Of romantic devotion there is scarcely a trace in Persian literature, even in the greatest epics of the Joseph and Zalikha cycle. It is furthermore a characteristic of Persian erotic verse that the beloved is represented as a boy, as is shown, for instance, by the constant allusions to the skinker or *saqi*. This usage, strange and easy of misinterpretation to the Western reader, is borrowed from Arabic poetic usage. The explanation seems to lie not in an assumption of low morality, but in the Arabo-Persian view that it is indelicate to refer openly to a woman. As the seclusion of women is universal throughout Mohammedan countries, the sole refuge left to the poet was to change in his verse the sex of his love. The incessant praise of wine was due to the fact that it is a forbidden drink. Strict Mohammedan orthodoxy condemns the wine-bibber to hell on the authority of the Koran. The Persians, however, being Shiites in creed, are opposed on principle to the orthodox Sunnis, and as the old Iranians in pre-Islamitic times were inclined to the use of wine, their descendants sing the praises of the grape in tones too real to be mistaken. Besides this exoteric reading of love and wine, there is, however, an esoteric interpretation. The beloved is God, the curl is the transient charm which partially hides His face, the mole is the centre of His divine unity, and the wine is the ecstasy which fills man, the lover, at the thought of reunion with the Beloved, absent for a time and seemingly cruel. The literal interpretation too common in the West, which disregards or denies the mystic element in this poetry, may with some good reason be regarded as inadequate. It is self-evident, on the other hand, that a solely Sufiistic view of these poems is equally misleading. The truth seems to be that there is no clear line of demarcation between the esoteric and the exoteric. Both were in many cases simultaneously present in the poet's mind.

In the Persian lyric by far the greatest names are those of Hafiz (q.v.) (fourteenth century), whose ghazals are his most famous poems, and of Omar Khayyam (q.v.) (died 1123), whose quatrains are the Persian poems best known to the Occident. Hafiz had been preceded by several poets of whom Kamal ud-din Isfahani (died 1237), Ibn Yamin (died 1344-45), and Salman of Sava (died 1376 or 1377) were the most noteworthy. After him came a long line of imitators of more or less ingenuity. Among them mention may be made of Jami, more famous as a didactic poet, and Amir Shahi (died 1453). Jami also had his lyric imitators, of whom the most noteworthy was Baba Fighani of Shiraz (died 1516 or 1519), who was called 'the minor Hafiz.' With Jami, however, the lyric poetry of Persia reached its climax, even though minor poets wrote, and though Akbar sought to rekindle the dying flame by his royal patronage. Closely connected with the lyric proper is parody. Here belongs especially the name of Abu Ishak (died 1427), who devoted himself in his *Diwan* to the glorification of gastronomy, sparing in his parodies neither Hafiz, Sadi, nor even Firdausi. A half century after Abu Ishak came Mahmud Kari, who sang the praises of clothes instead of food, and modeled a clothes State, which reminds one somewhat of Carlyle's *Sartor Resartus*, with burlesque substituted for philosophy. Beside the parody there is the lower vein of ribald verse, to which Orientals are somewhat inclined. Enough to mention the names of Sozeni (died 1173-74), Azraki (died 1132), and the greatest of them all, Ubaid Zakani (died 1370-71), beside whose verses even Martial loses piquancy. Here, too, is a Persian counterpart of Marguerite of Navarre, Mahisti, the favorite of the Sultan Sanjar (died 1157), who could write extremely spicy poems without forfeiting esteem. As is implied by the renown of Mahisti, Persian poetesses are not unknown. In the harem much fugitive verse was composed, chiefly, of course, of an erotic nature, but comparatively little has been preserved. As other subordinate forms of the lyric in Persia, the riddle and the *tarikh*, or chronogram, must be mentioned. The riddles do not differ essentially from those in other literatures. The chronogram is, however, comparatively rare outside of Arabic and Persian. It is formed by the construction of an appropriate sentence, the sum of the numerical values of whose letters equals the year in which the event alluded to by the sentence occurred. It is stated by Kazwini, for instance, with regard to the entrance of Hassan ibn Sabbah, the notorious leader of the Assassins (q.v.), into the fortress of Alamut, which had anciently been called Alah Amut, that "by a strange chance the sum total of the letters *Ulah Amût* in the Arabic chronogram was the year of his entry into the castle." Adding the numerical values of the letters of this name, $a = 1$, $l = 30$, $h = 5$, $a = 1$, $m = 40$, $\hat{u} = 6$, $t = 400$, we have the date of the event, 483 A.H. (= 1090 A.D.).

Closely connected with the lyric poetry of Persia, especially by the bond of mysticism, is the didactic and religious. So closely are the two related that it is sometimes impossible to decide to which class a poet belongs, because he in reality belongs to both.

The mystic and didactic poetry of Persia is entirely Sufiistic in character. The greatest of all who wrote in this genre was Jalal-ud-Din Rumi

(q.v.) (1207-1273), whose *Diwân* and *Mathnawi* are among our most important sources for the study of Sufiism. The first mystic poets, however, were probably Bayazid Bistâmi (died c.874) and Abu Said ibn Abul Khair (968-1049), of whose works a number of quatrains have survived. In the eleventh century the *Râhnamâ'inâmah* of Nasir-i Khusru deserves mention. The earliest great predecessor of Jalal-ud-Din, however, was Farid-ud Din Attar (q.v.) (died 1299), whose *Mantig ut-Tair*, or Bird-Parliament, is a remarkably beautiful allegory of the struggle of the soul to attain to the infinite. Here belongs also another of the greatest names of all Persian literature, Sadi (q.v.) (c.1190-1291). His *Gulistân*, or Rose Garden, and *Bûstân*, or Garden, are among the greatest didactic productions of the East. The last important mystic poet was Mahmud Shabistari (died 1317), the author of the *Gulshan-i-Râz* or Rose Garden of Mystery, which may serve as a text-book of Sufiistic philosophy.

The Court poetry, the third division of the lyric, is the least interesting of all from a literary point of view. The favor shown to poets from the earliest period of Islamitic rule in Persia naturally encouraged the production of eulogies, which, with the luxuriance of Oriental imagination, are so fulsome as to cloy the Occidental reader. The metrical intricacy keeps pace with the increasing artificiality of the Court poets. Such rhymes as *aaaaaaaaax, bbbbbbbbbx*, and so on, and a series of ghazals, united by *misra's*, or rhyming couplets at regular intervals, are common. Within the poems themselves there are conceits and obscure allusions which in many cases baffle even the ingenuity of an Oriental reader, and give rise to commentary after commentary. From the long series of poets of this type the names of Watwat (1088-1182), Muizzi (died 1147), Khakani (died about 1199), and the greatest of them all, Anvari (q.v.) (died about 1190), may be mentioned.

The drama of Persia, apart from the miracle play of *Hasan and Hosein* (q.v.), is of late development and little importance. The prose literature, as has been intimated, is also of small extent and value as compared with the poetry. While it is true that Sadi in the works already mentioned intermingled prose and verse, and that his example was followed by Nakhshabi (died 1330) in his *Sindbâdnamah*, or Book of Sindbad, it seems, nevertheless, strange that so few of the great Persian writers should have availed themselves of prose. There is, however, a mass of novels, tales, fables, legends, and anecdotes, as well as of history, encyclopædias, and the like. The oldest specimens of Persian prose are Muwaffak's book on pharmacology and Balami's translation of Tabari, both dating from the tenth century. As authors of notes and travel, we may mention Abu Tahir, whose numerous romances are chiefly concerned with old Iranian legends, as in his *Dâstân* or *Iahrumânnâmah* (dealing with the legend of Hushang) and his *Darâbnâmah* (on the story of Darius and Alexander), the anonymous writers of the *Sikandarnâmah* (on the Alexander legend), the *Hssah-i Hatim Tâ'i* (on Hotim Tai, proverbial for his generosity and nobility), and the modern Mohammed Taki (seventeenth century), the author of a huge romance in fifteen volumes, entitled *Bûstân-i Xayâl*. There is besides a multitude of novelettes and of tales in the style of the *Arabian Nights* (q.v.). Here the most important are the *Baxtyârnâmah*, or Book of the Ten Viziers, the *Jissa-i cahâr darwîš*, or Story of the Four Dervishes, perhaps by Amir Khusru (died 1325), the *Iutînâmah*, or Book of the Parrot, based on the Sanskrit *Sukasaptati*, and the *Bahâr-i dânîš*, or Spring Garden of Wisdom, by Inayat-ullah Kanbu (died 1671). The best known of all the prose fiction in Persian is Waiz Kashifi's (died 1504-05) *Anwâr-i Suhailî*, or Lights of Canopus, based on the *Kalila wa Dimmnah*, and so ultimately on the Sanskrit *Pañcatantra* (q.v.), although the *Latâ'if ut-tawâ'if*, or Witty and Amusing Stories, by Sali, the son of Waiz Kashifi, also deserves mention.

Consult: Hammer, *Geschichte der schönen Redekünste Persiens mit einer Blütenlese* (Vienna, 1818); Onseley, *Biographical Notices of Persian Poets* (London, 1846); Barbier de Meynard, *La poésie en Perse* (Paris, 1877); Darmesteter, *Les origines de la poésie persane* (ib., 1887); Pizzi, *Storia della poesia persiana* (Turin, 1894); Ethé, *Die höfische und romantische Poesie der Perser* (Hamburg, 1887); id., *Die mystische, didaktische und lyrische Poesie und das spätere Schriftthum der Perser* (ib., 1888); id., "Neupersische Literatur," and Nöldeke, "Das iranische Nationalepos," in Geiger und Kuhn, *Grundriss der iranischen Philologie*, vol. ii. (Strassburg, 1896); Reed, *Persian Literature, Ancient and Modern* (Chicago, 1893); Horn, *Geschichte der persischen Literatur* (Leipzig, 1901); Remy, *Influence of India and Persia on the Poetry of Germany* (New York, 1901); Browne, *Literary History of Persia* (London, 1902); Chodzko, *Specimens of the Popular Poetry of Persia* (London, 1842); Costello, *Rose Garden of Persia* (new ed., ib., 1899); Dole and Walker, *Flowers from Persian Poets* (New York, 1901).

PERSIAN MUSIC. See Arabian Music.

PERSIAN MYTHOLOGY. Only scanty traces of the mythology of ancient Persia have survived. The reform supposedly instituted by Zoroaster (q.v.) seems to have swept away the older nature worship which prevailed in Iran as in India. It is evident, however, that this reform was not absolutely thorough, and that under the orthodoxy which was forced on the people by Vishtaspa, the royal patron of Zoroaster, according to the rather doubtful Parsi traditions, there lurked many old beliefs and myths which were heritages of the Indo-Iranian religion. When the first enthusiasm of this Zoroastrian Protestantism died out, the ancient faith revived in some measure, and in the Yashts, a part of the Avesta (q.v.) late in form, but almost certainly old in content, many mythological allusions may be found. In some of the Pahlavi texts (see Pahlavi Literature), especially in the Bundahish, there survive numerous traces of the primitive faith, despite the Zoroastrian orthodoxy to which they theoretically conform. The six Amshaspands, who in Zoroastrianism represent the cardinal virtues of Good Mind, Best Righteousness, Desirable Kingdom, Holy Concord, Health, and Immortality, were originally deities protecting respectively cattle, fire, metals, earth, water, and plants, being therefore nature divinities. Ormazd, who in the Zoroastrian reform became the chief, and really the only god, was originally a sky-deity, whose son was the fire, and who

was also the father of the Good Mind, or, in the early evaluation of this godling, of cattle. His daughter was Holy Concord, the earth, who from many allusions in the Yashts was a goddess of fertility. The demons, who play a subordinate part in the orthodox texts, find a more prominent place in the Yashts. Important here is the serpent Azhi Dahaka, who was probably the sky-serpent, corresponding to the Vedic Vritra slain by Indra (q.v.), especially as the Bundahish describes him as falling from heaven. The Yashts emphasize the nature worship of the pre-Zoroastrian religion in the chapters devoted to the sun, the moon, the planet Tishtrya, who, mounted on a black horse, perhaps the storm-cloud, defeats the demon Apaosha, drought, and to the waters, Anahita, who is the Anaïtis (q.v.) of the classical writers. To all these not only heroes, but even Ormazd himself, offer sacrifices, clearly pointing to an earlier period when one god was dependent on another for aid. Ghost worship also (see GHOSTS) is represented by the cult of the Fravashis, who seem to have originally represented the spirits of the beneficent dead. The cosmogonic mythology (see COSMOGONY) is largely derived from Semitic sources, for the antithesis of Ormazd, the god of the sky and light, to Ahriman (q.v.), the god of darkness, and their conflict at the creation of the world, is precisely analogous to the battle of the Babylonian solar deity Marduk with Tiamat, the demon of chaos. About trees and animals myths clustered. In the white *Hōm* tree, which will give man immortality at the day of resurrection, there is a pre-Zoroastrian reflex of the Semitic tree of life, while the human-headed bulls of Assyrian sculptures are represented by Gopatshah, a being half bull and half man, who pours holy water into the sea. With the downfall of the Iranian religion before Mohammedanism, the old myths vanished almost entirely, so that the mythology of modern Persia is practically Islamitic. However, the *pairika*, a female demon of Iran, is preserved as the beneficent *péri* of modern Persian folk-lore, and the *simurgh*, a bird of magic properties, has become the *roc* of the *Arabian Nights*.

PERSIAN POWDER. See INSECT POWDER.

PERSIGNY, pâr'sē'nyē', JEAN GILBERT VICTOR FIALIN, Duke de (1808-72). A French politician, born at Saint-Germain-Lespinasse, in the Department of Loire. He joined the hussars in 1828, but after the Revolution of July, 1830, owing to doubts as to his loyalty, he was expelled from the army on a charge of insubordination. He now became a journalist in Paris, formed the most intimate relations with Louis Napoleon, and commenced a career of Bonapartist propagandism throughout France and Germany, in which he displayed extraordinary energy, pertinacity, and fertility of resource. Articles from his pen had already appeared in *Le Temps*, and in 1834 he founded *l'Occident français* as a Bonapartist organ. He had the chief hand in the affair of Strassburg (See NAPOLEON III.). He also took part in the expedition to Boulogne, where he was captured and condemned to twenty years' imprisonment. His confinement, however, became almost nominal, and he passed his time in writing a voluminous and singular work on the *Utilité des pyramides d'Egypte* (1844). On the breaking out of the Revolution in 1848 Persigny hurried to Paris, and set himself, with his accustomed vigor and swiftness, to organize the Bonapartists. He was appointed aide-de-camp to the President, Louis Napoleon, and major-general of the Parisian National Guard. In 1849 he was chosen a member of the Legislative Assembly. He was sent to Berlin as Ambassador at the close of the same year. As was to be expected, Persigny took a prominent part in the coup d'état of December 2, 1851. In January, 1852, he succeeded Morny as Minister of the Interior. From 1855 to 1858, and again from 1859 to 1860, Persigny was the French Ambassador to Great Britain. He was recalled to France, however, in 1860, to resume the office of Minister of the Interior. This office he resigned in June, 1863, when the elections of Paris and other large towns showed dissatisfaction with his policy. In the autumn of the same year he was created a duke. He did not long survive the overthrow of the Second Empire, his death occurring at Nice, January 13, 1872. Consult references under NAPOLEON III.; also Delarva, *Le duc de Persigny et les doctrines de l'empire* (Paris, 1865); Delard, *Histoire du Second Empire* (ib., 1868-75).

PERSIMMON (from the Virginia Indian name), or DATE PLUM. A tree and its fruit, including several species growing wild and cultivated to some extent. The Japanese persimmon or kaki (*Diospyros kaki*) is the principal native fruit of Japan. It is found also in Korea, Eastern and Southern China, and parts of the East Indies. It is grown to a limited extent in Southern Europe, and was introduced into the United States about 1875. It finds a congenial climate in California and the Southern States as far north as Virginia. The cultivated trees grow 8 to 12 feet high, and bear a very attractive yellow, thin-skinned globose fruit often attaining the size of a medium orange. When ripe, the fruits contain a soft sweetish pulp. A number of varieties are in cultivation, and these vary much in size, color, the number of seeds they contain, period of ripening, etc. The American persimmon (*Diospyros Virginiana*) is native from Pennsylvania and Indiana south to the Gulf. Wild trees sometimes reach a height of sixty feet in the forest, and are valuable as cabinet woods. In the open the trees seldom exceed 20 to 30 feet in height. Another American species, *Diospyros Texana*, is grown in Texas. The fruits of the American persimmon are much smaller than those of the Japanese varieties, are very soft when ripe, and on this account are seldom marketed.

NATIVE PERSIMMON (*Diospyros Virginiana*).

Persimmons are propagated from seed. Varieties seldom reproduce themselves, and so budding and grafting are resorted to. Seed sown in the fall is allowed to grow the following season. The second spring the seedlings are either budded or crown grafted. Grafting gives the better results. Native trees may be successfully top-grafted with improved varieties. In transplanting to the orchard trees one to two years from the graft are preferred. Persimmons thrive on nearly all soils. Like other orchard fruits, they respond generously to cultivation. Trees come into bearing within four years after setting in the orchard. Top-worked trees produce fruit within three years from the graft. Japanese varieties are inclined to overbear, and should therefore be thinned. The green fruit of all varieties of persimmons is extremely astringent, and maintains this condition until fully ripe. The ripening period of the different varieties varies from August until December. The Japanese sorts should be gathered before frost and stored in a cool, well-ventilated, moist room until fully ripe. Some native persimmons ripen before frost, which greatly improves others. The fruit is usually consumed fresh as a dessert or out of hand. Some varieties may be dried or preserved. Consult: Hadley and Troop, *The American Persimmon;* Indiana Agricultural Experimental Station Bulletin 60; Watts, *Persimmons;* Tennessee Agricultural Experimental Station Bulletin XI., No. 1. In the latter bulletin both native and Japanese persimmons are considered. See Plate of Papaw and Persimmon.

PERSIMMON INSECTS. The persimmon does not suffer greatly from the attacks of insects. Several caterpillars may occasionally defoliate individual trees, especially the larva of *Spilosoma virginica*, *Orgyia leucographa*, *Tolype velleda*, and *Edemasia concinna*. The little leaf-miner (*Aspidisca diospyriella*) forms a minute blotch-mine in the leaves of this tree, and eventually cuts out a case in which it pupates. One of the plant-lice (*Aphis diospyri*) seems to be specifically attached to this tree, but does little damage, and the same may be said of one of the flealice (*Psylla diospyri*). One of the weevils of the family Otiorhynchidæ, namely *Brachystylus acutus*, is found only on the persimmon, but does comparatively little damage.

PERSIO. See Arcuil.

PERSIUS (Aulus Persius Flaccus). One of the most famous Roman satirists. He was born at Volaterræ (now Volterra), in Etruria, A.D. 34. He was of a distinguished equestrian family, was educated under the care of the Stoic philosopher Cornutus, lived on terms of intimacy with the most distinguished personages of his time in Rome, and died November 24, A.D. 62, in the twenty-eighth year of his age. The principal authority for the life of Persius is an abridgment of a 'commentary' by one Probus Valerius. Modest and gentle in his manners, virtuous and pure in his whole conduct and relations, he stands out conspicuously from the mass of corrupt and profligate persons who formed the Roman 'society' of his age, and vindicated for himself the right to be severe by leading a blameless and exemplary life. His six satires were greatly admired, not only in Persius's own day, but all through the Middle Ages; but the estimate which modern critics have formed of his writings from a literary point of view is not so high. He is remarkable for the sternness with which he censures the corruption of morals then prevalent at Rome, contrasting it with the old Roman austerity and with the Stoic ideal of virtue. The language is terse, homely, and sometimes obscure, from the nature of the allusions and the expressions used, but the dialogues are the most dramatic in the Latin tongue. The *editio princeps* appeared at Rome in 1470; later editions are those of Isaac Casaubon (Paris, 1605); Passow (Leipzig, 1809); Jahn (Leipzig, 1843); Hermann (Leipzig, 1881); Conington (with an English translation and commentary, revised by Nettleship, Oxford, 1893); and Bücheler (Berlin, 1893). Persius has been frequently translated; the two best English translations are those by Dryden and Conington. There is a complete bibliography of Persius by Morgan (Cambridge, Mass., 1893).

PERSON (OF. *persone*, Fr. *personne*, from Lat. *persona*, person, actor's mask, from *personare*, to sound through, from *per*, through + *sonare*, to sound, from *sonus*, sound; connected with Skt. *svana*, sound, from *svan*, to sound). In theology, the word person is applied to the distinctions in the divine Trinity in a modified sense. Sabellius applied the Greek word *prosopon* (face) to the Father, Son, and Spirit, on the supposition that they were three separate appearances, or faces, of the one divine nature. In the trinitarian controversy culminating at Constantinople (381), the orthodox party accepted the term, but affirmed that the 'faces' were eternal faces, or were manifestations of eternally existing distinctions. The natural tendency of the word, when the meaning 'person' had become attached to it, was to emphasize the separateness of the trinitarian hypostases, and in that respect it had a bad influence.

PERSONA GRATA (Lat., acceptable person). A term applied to a diplomatic agent, indicating that he is acceptable to the sovereign to whom he is accredited. See Diplomatic Agents.

PERSONAL ACTION. Under the common-law system of pleading and practice, any action available to enforce rights or redress wrongs, including actions to recover possession of personal property, and excluding actions to recover possession of involving rights in real property. See Action; Forms of Action; Pleading.

PERSONAL EQUATION. See Equation, Personal.

PERSONALITY. See Individuality; Mental Constitution; Self.

PERSONAL PROPERTY; PERSONALTY. These terms are applied to all that class of property which is to be distinguished from real property or real estate, and which consists for the most part of property which is either movable or merely temporary in character. The only absolute distinction, however, between real and personal property lies in the legal method of its disposition after the death of its owner. Real property is inheritable or descendible, and passes to the legal heirs of the owner according to the rules of the common law or statutes governing descent. Personal property is not inheritable, but passes to the administrator or executor of the deceased person.

The term 'personal property' is generally used as synonymous with 'goods' or 'goods and chattels.' The term, however, has a broader significance than either of those terms, and includes both chattels and choses in action. Property that is personal in its nature may become real by becoming affixed to real property, and in the same way real property may be converted into personal property by severance from the realty.

Title to personal property may be acquired in three ways: (1) By original acquisition; (2) by transfer by operation of law; (3) by transfer by act of the parties.

(1) Property acquired by original acquisition may be acquired by either: (a) occupancy when one appropriates to his own use a thing which was not then subject to ownership, as in the finding and appropriation of lost property or the capture of wild animals; or (b) accession, which is the right which a person has to all the property which his own property produces, as the young of animals, and the right to all property which is annexed naturally or artificially to his own property; or (c) by confusion, which is the inextricable commingling of other property with one's own property; or (d) by intellectual labor, which is the source of the property right of authors and inventors in their writings and inventions.

(2) The transfer of the title to personal property by operation of law may be by forfeiture; by sale under execution; by operation of bankruptcy or insolvency laws; by exercise of the right of eminent domain; by marriage; by death of the owner; or by escheat.

(3) Transfer of title of personal property may be accomplished by act of the parties. At common law all that is necessary to transfer an interest in personal property from one to another is intent or mutual meeting of the minds of the parties without writing or other formality. (See CONTRACT; SALES; GIFT.) Modern statutes have made formalities requisite under some circumstances in order to protect the rights of the transferee from the claims of third persons.

For further information as to the various kinds of personal property, the methods of acquisition, and transfer of title thereto, the remedies for injury to personal property, etc., consult such subjects as CHATTELS; CHOSE IN ACTION; DESCENT; ADMINISTRATION; FIXTURES; EMBLEMENTS; ESTRAY; FERÆ NATURÆ; PATENT; LITERARY PROPERTY; FRAUDS, STATUTE OF; MORTGAGE; TORT; CRIME, etc.

Consult: Schouler, *The Law of Personal Property* (3d ed., Boston, 1896); Brantley, *Principles of the Law of Personal Property* (San Francisco, 1890); Goodeve, *Modern Law of Personal Property* (3d ed., London, 1899); Williams, *Principles of the Law of Personal Property for the Use of Students in Conveyancing* (15th ed., London, 1900).

PERSONAL REPRESENTATIVE. Besides its general sense of one who succeeds to or represents another in the enjoyment or possession of rights or property by reason of some relationship existing between them, the term personal representative is specifically used in law to designate the person who as executor or administrator administers the estate of another. In the general sense of the word it is applied to those who represent others in conducting transactions, as one acting under a power of attorney to vote stock, and also to those who succeed to property by assignment, as the assignee of a lessee for years, and sometimes in wills for those who are technically called next of kin (q.v.), according to the statute of distribution, and, in its broadest use, even all persons who stand in the place of another and represent his interests, respecting his property, whether transferred to them by law or by his act.

Primarily and usually, however, the term is used to designate only executors or administrators as officially administering the estate of the deceased, and in that capacity protecting it from dissipation or waste, as well as paying out of it the debts of the decedent, and distributing the surplus, if any. Unlike the heir under the civil law the personal representative is not liable for any debts of the decedent, except to the extent of the assets received by him; and neither is he now entitled to any surplus remaining after the payment of the obligations of the estate. His duties, and the method and form of his administration are usually particularly prescribed by statute. See ADMINISTRATION; EXECUTOR; DISTRIBUTION, etc., and compare KIN, NEXT OF, and HEIR.

PERSONIFICATION (from Lat. *persona*, person + *facere*, to make). A figure of rhetoric by which inanimate objects, or mere abstract conceptions, are invested with the forms and attributes of conscious life. See RHETORIC, FIGURES OF; METAPHOR.

PERSOON, pâr'sōn, CHRISTIAN HENDRIK (1755-1837). A Dutch physician and botanist, born at the Cape of Good Hope, Africa. He was educated in Holland and practiced his profession for a number of years in Germany. He went to Paris about 1802, where he published several interesting works on cryptogamous plants; also, a *Synopsis of Plants* in two volumes. The titles of his principal works are: *Observationes Mycologicæ* (1796); *Synopsis Methodica Fungorum* (1801); *Icones Pictæ Speciorum Rariorum Fungorum* (1803-08); *Synopsis Plantarum* (2 vols., 1805-07). The Australian genus Persoonia is named in his honor. It embraces about 60 species, some of which are valuable timber trees.

PERSPECTIVE (Fr. *perspective*, from Lat. *perspectus*, p.p. of *perspicere*, to see through, from *per*, through + *specere*, to see). The art of representing natural objects upon a plane surface in such manner that the representation shall affect the eye in the same way as the objects themselves. The distance and position of objects affect both their distinctness and apparent form, giving rise to a subdivision of perspective into *linear* perspective, which is strictly scientific and a branch of applied geometry, and which, as its name denotes, considers exclusively the effect produced by the position and distance of the observer upon the apparent *form* and *grouping* of objects; and *aerial* perspective, which confines itself to their distinctness, as modified by distance and light, and belongs to the non-scientific sphere of pictorial representation. After the 'scope' (i.e. the number of objects to be introduced, and the distance at which they are to be viewed) of the picture has been determined, and before the design is commenced, it is necessary to draw upon perspective plan three lines: (1) The *base line*, or *ground line*, which limits the sketch toward the

spectator, and is the base line of the picture. (2) The *horizontal line*, which represents the ordinary position of the sensible horizon. The height of the horizontal line is about one third of the height of the picture, when the sketcher is placed at or a little above the level of the horizon; but it may rise in a degree corresponding to his increase of elevation till it reaches near to the top of the perspective plan. The general rule is to have a high horizontal line when the view is taken, or supposed to be taken, from an eminence; but when the station is on a level, either actual or assumed, the horizontal line must be low. The horizontal line in nearly all cases is supposed to be level with the spectator's eye. (3) The *vertical line*, which is drawn from the supposed position of the sketcher, perpendicular to the *ground* and *horizontal* lines, meeting the latter in a point which is called the *point of sight*, or centre of the picture. The vertical line has no representative in nature, and is merely a mechanical adjunct to the construction of the picture, all vertical lines in nature being parallel to it in the picture. The point of sight, being the point directly opposite to the observer, is often placed in the centre of the picture; but we very frequently find it on the right or left side, though always, of course, on the horizontal line. All lines which in nature are perpendicular to the ground line, or to a vertical plane which is raised upon it as a base, meet in the point of sight, which is thus their *vanishing point* (see the line of the tops and bottoms of the pillars in Fig. 1). The *points of distance* are two points in the horizontal line on each side of the point of sight, and in a 'direct' sketch are at a distance from it equal to the horizontal distance of the sketcher's eye from the ground line. The equality of distance of these points from the point of sight is not, however, necessary, as it occurs only in those cases where the lines, of which the points of distance are the *vanishing points*, are inclined (in nature) at an angle of 45° to the base line; but, in all cases, the two points of distance are about twice as far apart as the eye is from the picture. One important use of the points of distance is to define the distance of objects in a row (Fig. 1) from each other. For this purpose, two points of distance are not necessary, as, when the position of one pillar is found, that of the opposite is at once obtained by drawing a line parallel to the base or ground line.

There are many other groups of parallel lines in a picture which have different situations, and therefore different vanishing points. Such lines with their vanishing points (called, for distinction's sake, *accidental points*) are represented in Fig. 2. If the accidental point is above the horizontal line, it is called the *accidental point aërial*—if below, the *accidental point terrestrial*; and a little consideration makes it evident that these points may or may not be situated within the plane of the picture. Such are the points and lines necessary for the construction of a plan in true perspective; and from the above explanation, we may deduce the two general principles: (1) That all parallel straight lines in nature are no longer parallel when projected on the perspective plane, but meet in a point which is called the vanishing point, and is some one of the three above described, unless these lines happen to be also parallel to the ground line or the vertical line, in which case they remain parallel when transferred to the picture; and (2) that since the bodies drawn below the horizontal line are seen as if from above, those above as if from below, and those to the right and left of the point of sight as if observed from the left and right, it follows that straight lines which in the picture are above the horizontal line lower themselves, and those below raise themselves to it; those to the left, following the same law, direct themselves to the right, and vice versa.

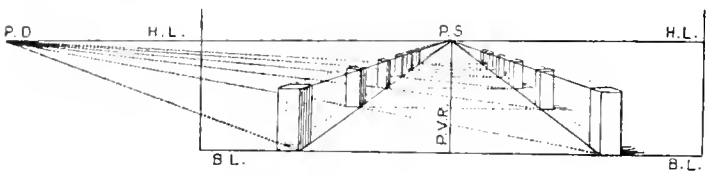


Fig. 1.

Illustrating the more important points and lines. PVR is the principal visual ray.

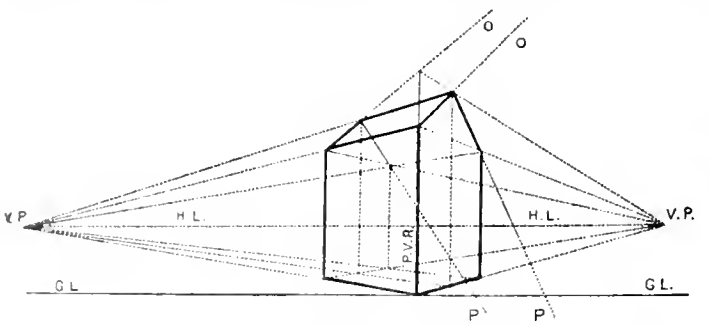


Fig. 2.

The lines OO converge to the accidental point aërial, and PP to the accidental point terrestrial.

Besides the more usual angular perspective there is the *bird's-eye perspective*, when the eye is taken up to an imaginary high level: the *curvilinear* or panoramic perspective, in which the surface of projection is a concave cylinder: and the *oblique* perspective, with its triple horizons and vanishing points.

Aërial perspective consists in a modulation of the brightness and colors of objects in accordance with the state of the atmosphere, the depth of the body in the perspective plane (i.e. distance in nature from the ground line), and other accidents of place and time. As the distance of objects increases, their illuminated parts are made less brilliant, and their shaded parts more feeble. The bluish tint imparted by a large mass of the atmosphere to the bodies seen through it is fre-

quently imitated by the mixing of a slight tint of blue with the colors to be applied; a yellow object thus assumes a greenish tint; a red one a violet tint, etc. The air, when charged with vapor, is represented by a diminution of the brightness of colors, and by the grayish tint imparted to them.

Architectural perspective is simply the application of linear perspective to architectural drawing. The plans, elevations, and sections by which buildings are represented in the working drawings are orthographic projections, which give the correct geometric and dimensional relations of the various parts of the building shown, but present in each case only two dimensions, and do not exhibit the natural aspect of the structure as it appears to the eye from any given point of view. This deficiency is supplied by the perspectives, which show its appearance as seen from one or another point of view, all three dimensions being represented, but with the foreshortenings and angular distortions of its actual appearance from the given point. It is customary to make perspectives not merely of the exterior of a projected or executed building, but also of the more important interior portions. See DRAWING.

HISTORY. Knowledge of perspective in all its branches is comparatively modern.

Oriental art knew nothing of any branch. A glance at Egyptian and Assyrian reliefs shows that the most elementary principles were ignored. Buildings and trees were laid flat on the ground or stood up in front view; the figures were placed one on top of the other instead of on different planes.

Greek art first studied and solved some of the mysteries of linear perspective, but it is doubtful that the Greeks ever got beyond the architectural form into the plastic and pictorial forms. This step was reserved for the more realistic art of the Alexandrian and especially the Roman age. The frescoes at Pompeii often exhibit an elaborate attempt to draw buildings in perspective with varying degrees of unsuccess.

Renaissance art, however, attacked almost immediately the question of linear perspective in all its branches. Such men as the Pollainolo and Andrea del Castagno, Melozzo and Mantegna revelled in their ability to overcome its difficulties. After playing with architectural design, with both normal and abnormal base lines, they played with the foreshortening of figures. From painting the use of linear perspective crept into sculpture, especially through Donatello. During the fifteenth century aërial perspective appeared in the landscape backgrounds of the early Flemish painters, like the Van Eycks, whose use of oil colors gave the necessary element of depth, diffused luminosity, and softness. The highest development of aërial perspective, however, was accomplished mainly by the Venetians of the sixteenth century, like Paolo Veronese, and by Correggio.

BIBLIOGRAPHY. Early treatises are Houdin, *La perspective* (Paris, 1642); Alberti, *Deux livres sur la perspective* (Nuremberg, 1671). The subject is very fully treated in Ware, *Modern Perspective* (Boston, 1885). Consult also: Cloquet, *Nouveau traité élémentaire de perspective* (Paris, 1823); Herdman, *Curvilinear Perspective in Nature* (London, n. d.); Seeberger, *Principien der Perspektive* (7th ed., Munich, 1900); Checa, *La perspective* (Paris, 1900); La Gournerie, *Traité de perspective linéaire* (ib., 1898); Pratt, *Perspective*, including the *Projection of Shadows and Reflections* (London, 1901); Conz, *Lehrbuch der Perspektive* (2d ed., Stuttgart, 1902).

PERSPECTIVE. In mathematics, a term applied to figures, one of which is formed from another by a single central projection. Thus, if from a point S, exterior to two planes P and P', a pencil of rays pass through the vertices of a triangle ABC situated in plane P, these rays meet P' in the vertices of a triangle A'B'C' *in perspective* with the triangle ABC. In general, P cuts P', and the line of intersection is called the *axis* of perspective, the point S being called the *centre* of perspective. If the planes P and P' be brought into coincidence, the triangles, or other figures similarly related, are still said to be in perspective. In two perspective figures, a point or line of one corresponds to a unique point or line of the other, hence a curve and its projection are of the same order and the same class (see CURVE), e.g. a conic section is always projective, or in perspective with a conic section, although the species may not be the same. Many properties of perspective figures are demonstrated by means of the fundamental proposition: The anharmonic ratio (q.v.) of perspective ranges is constant. See PROJECTION.

PERSPECTIVE DRAWING. See DRAWING.

PER STIRPES (Lat., according to stocks). A term used in designating that succession to the property of a deceased person by which the descendants take 'by the stock or root of their race'; that is, by virtue of representing an ancestor who would have been entitled to take if alive. The term is used in opposition to the phrase *per capita*. By the general rule, where the descendants of the same deceased ancestor are of unequal degrees of relationship, they take *per stirpes*, instead of *per capita*. For example, if A dies, leaving three living children, B, C, and D, and three grandchildren, the children of his deceased child E, those descendants will take *per stirpes*, that is, the estate will be divided into four parts, each of the living children, B, C, and D, taking one part, and the three grandchildren taking the fourth part, which their ancestor, E, would have taken if alive. If there is real estate, the three grandchildren will become tenants in common of the whole, with the three living children, and will be entitled to one undivided fourth part thereof. In some States the above rule is not followed, and the statutes of each State should be consulted. See DESCENT; DISTRIBUTION; PER CAPITA; SUCCESSION.

PERTH, pĕrth. The capital of West Australia, situated on the north bank of the Swan River, 10 miles northeast of Freemantle, on the Eastern Railway, in the vicinity of the Victoria range of mountains, and surrounded by picturesque scenery (Map: Australia, B 5). It is the see of Anglican and Roman Catholic bishops. The most notable of the public buildings are the Government and Parliament houses. It received a marked influx of population during the last decade of the nineteenth century, owing to the discovery of gold in the district. Population, in 1890, 9617; estimated, in 1895, 19,600.

PERTH. The capital of Perthshire, Scotland, a city, royal and Parliamentary burgh, on the Tay, 45 miles northwest of Edinburgh (Map: Scotland, E 3). The charming scenery of the immediate vicinity, the Tay, sweeping southward along its eastern side, and the superb background of the Grampians, on the north, render the site of the 'Fair City' exceedingly beautiful; while the important rôle it has played in the history of the country claims for it a high rank among the cities of Scotland. The river is spanned by two handsome bridges, and there are two beautiful public parks, called the North and South Inches. Among the most interesting public buildings are the Church of Saint John (whence Saint Johnstown, or Saint John's Town, the old name of the city); the Episcopal Cathedral of Saint Ninian's; the county building; the town-house, part of which is as old as 1210; King James VI.'s Hospital; the infirmary; and the city prison. At the head of the South Inch stands the penitentiary, or general prison, where all criminals sentenced to imprisonment for long periods are confined. The town also contains a statue of Albert, Prince Consort, a public library, the museum of the Antiquarian Society, public seminaries, and other educational institutions. It has ink, glass, cotton, and dye works, iron foundries, breweries, linen and wincey manufactures, shipbuilding yards, distilleries, and extensive bleaching fields. The salmon fishery on the Tay is very valuable. The total quayage of Perth harbor is 1225 feet, and vessels of 200 tons can draw alongside. Perth has a charter as a royal burgh from King William the Lion (1165-1214). Perth was the scene of the murder of the Earl of Cornwall, by his brother Edward III., in 1336; of a combat between two Highland clans (1396), described in Scott's *Fair Maid of Perth;* of the assassination of James I. in 1437, notwithstanding the heroic action of Catharine Douglas, who died to prevent the entry of the murderers by making her arm do duty for the missing bar on the door; and of Knox's Reformation sermon. Population, in 1891, 30,000; in 1901, 32,872. Consult Peacock, *Perth: Its Annals and Archives* (London, 1849).

PERTH, Five Articles of. Certain articles agreed upon in a meeting of the General Assembly of the Church of Scotland, convened at Perth, by command of King James VI. (James I. of England) on August 25, 1618. They enjoined kneeling at the Lord's Supper; the observance of Christmas, Good Friday, Easter, and Pentecost; confirmation; and sanctioned the private administration of baptism and the Lord's Supper. They were highly obnoxious to the Scotch Presbyterians, not only because of their character, but because they were adopted without discussion in mere compliance with the will of the King. The General Assembly at Glasgow in 1638 declared that at Perth to have been 'unfair, unlawful, and null,' and condemned the five articles.

PERTH, George Drummond, Earl of (1807-1902). A British nobleman. He was born in London during the reign of George III. and consequently saw five monarchs occupy the throne of the United Kingdom. For a short time he served as an officer in the 93d Sutherland Highlanders, and, from 1853 till 1859, was a major in the Victoria Middlesex Rifles (Volunteer). Because of his ancestors he was chief of the Clan Drummond, 14th Earl of Perth, 6th Earl of Melfort, Viscount Melfort and Forth, Baron Drummond of Cargill, Baron Drummond of Stobhall and Montifex, Baron Drummond of Richertown, Castlemaine, and Galstown, hereditary Thane of Lennox, hereditary Steward of Monteith and Strathearn, Duc de Melfort, Comte de Lussan, and Baron de Valrose. When he died these titles were separated, as he left no direct male heir.

PERTH AMBOY, ăm-boi' or ăm'boi. A city and port of entry in Middlesex County, N. J., 15 miles south of Newark; on Raritan Bay, at the mouth of the Raritan River, and on the Lehigh Valley, the Central of New Jersey, the Pennsylvania, and the Staten Island Rapid Transit railroads (Map: New Jersey, D 2). It has a fine harbor, with transportation facilities by water, and controls important shipping interests, particularly in coal. The manufactures, which are extensive, include terra cotta, bricks, chemicals, oil, cork, copper, iron, steel, and lumber, the first two named being developed from the valuable deposits of fire clay found in the vicinity. There are also two large smelting and refining plants and important shipbuilding interests. The city hall park and the bridge of the New Jersey Central Railroad are among the features of Perth Amboy. The government is administered, under a charter of 1871, by a mayor, elected every two years, and a council which has powers of election and confirmation in important administrative offices. The water-works are owned and operated by the municipality. Population, in 1890, 9512; in 1900, 17,699.

Perth Amboy was settled in 1683, and was expected soon to outstrip its neighbors and become 'the London of America.' It was named Perth, after James, Earl of Perth, but 'Amboy,' the original Indian name for the place, was soon added. It was the capital of the province from 1684 almost continuously up to the time of the Revolution. William Franklin, the last royal Governor, was captured here in 1776. Perth Amboy was incorporated as a city in 1784. Consult Whitehead, *Contributions to the Early History of Perth Amboy* (New York, 1856).

PERTHES, pâr'tâs, Friedrich Christoph (1772-1843). A German publisher and patriot. He was born at Rudolstadt. In his fifteenth year he was apprenticed to a Leipzig bookseller, with whom he remained six years. In 1793 he was employed by Hoffman, the Hamburg bookseller, and in 1796 started business on his own account, and developed an important publishing business. The iron rule of the French in Northern Germany, and the prohibition of intercourse with England, nearly ruined trade, yet Perthes found ways and means to extend his business. He endeavored to enlist the intellect of Germany on the side of patriotism, and in 1810 started the *National Museum.* Its success was far beyond Perthes's expectations, and encouraged him to continue his patriotic activity, till Hamburg was formally incorporated with the French Empire. He subsequently took a prominent part in the movement that forced the French garrison to evacuate Hamburg, March 12, 1813; and on its reoccupation by the French, he was one of the ten citizens who were specially excepted from pardon. In 1822 Perthes removed to Gotha, where he devoted himself to the publication of historical and theo-

logical works. He was the prime mover in the organization of the German book trade and in the foundation of a museum connected therewith. His correspondence with literary, political, and theological notables is extremely interesting, and throws light upon the inner life of Germany early in the nineteenth century. Consult the biography (12th ed., 1853), by his second son, Clemens Theodor Perthes.

PERTHITE. A red flesh-colored feldspar, consisting of interlaminated orthoclase and albite, that is found in Perth, Canada. It often affords bright aventurine reflections, and consequently is in some demand as a gem.

PERTH'SHIRE. An east midland county of Scotland, bounded north by Inverness and Aberdeen, east by Forfar, Fife, and Kinross, south by Sterling and Clackmannan, and west by Argyll and Dumbarton (Map: Scotland, D 3). Area, 2528 square miles. It is divided into highland and lowland districts, the former occupying the larger surface. The Grampian Mountains here reach altitudes of 3843 and 4000 feet respectively in Ben More and Ben Lawers. The lakes are numerous and include Locks Tay, Erieht, Katrine, and Aehray. The principal river is the Tay. The climate is comparatively mild and healthful. Old red sandstone, granite, and slate abound; in the lowland districts the soil is composed mostly of a rich loam, in which crops of all kinds are brought to perfection; only about one-fifth of the total area, however, is under cultivation. The highland districts are chiefly devoted to sheep pasturage and extensive deer forests. Stock-raising is largely carried on. The chief industries are the manufacture of textiles, bleaching, and dyeing. Capital, Perth. Population of county, in 1891, 122,185; in 1901, 123,260. Consult Drummond, *Perthshire in Bygone Days* (London, 1879).

PERTINAX, Publius Helvius, Emperor of Rome. He was born, according to Dio Cassius, at Alba-Pompeia, a Roman colony of Liguria, A.D. 126. He received a good education, and, entering the military service, rose through the various grades till he obtained the command of the First Legion, at the head of which he signalized himself in Rhætia and Noricum against the native tribes. In 179, or, according to other authorities, in 172, he was chosen consul, aided in repressing the revolt of Avitus in Syria, and was Governor successively of the provinces of Mœsia, Dacia, and Syria. He was sent by the Emperor Commodus to take the command of the turbulent legions in Britain, and these troops, against his will, proclaimed him Emperor; on which he solicited a recall, and was appointed proconsul of Africa, prefect of Rome, and consul (a second time) in 192. On the death of Commodus, his assassins almost forced Pertinax to accept the purple, which with great hesitation he did (January 1, 193), but in spite of his promise of a large donation, he was unable to gain over the Prætorian Guard. His accession was, however, hailed with delight by the Senate and people, who were rejoiced to have, as ruler, an able captain, instead of a ferocious debauchee; and Pertinax, encouraged by this favorable reception, announced his intention of carrying out an extensive series of reforms, having reference chiefly to the army, in which he hoped to reëstablish the ancient Roman discipline. Unfortunately, he was attacked by a band of the rebellious prætorians, about three months after his accession, and, disdaining to flee, was slain (March 28, 193). His head was carried about the streets of Rome in triumph.

PERTURBATIONS (Lat. *perturbatio*, confusion, from *perturbare*, to confuse, from *per*, through + *turbare*, to disturb, from *turba*, throng, tumult). In astronomy, a term used to describe disturbances in the orbital motion of the planets or other celestial bodies. The simplest kind of motion imaginable under the law of gravitation would be that of a small material particle revolving about a larger central attracting body. If this particle is so small that its mass may be neglected altogether, as being inappreciable in comparison with that of the central body, then the particle will describe an elliptic orbit having the larger body in one of its foci. If, however, both bodies have masses so large that neither is negligible, then each body will describe an elliptic orbit having the common centre of gravity of the two bodies in the common focus, and its distance from either body will be inversely proportional to that body's mass. Thus the larger body will describe proportionally the smaller orbit. The problem of determining mathematically all the circumstances of motion in such a system is called the 'problem of two bodies,' and its complete solution is possible. When the number of bodies in a system is increased to three, we have the famous 'problem of three bodies,' whose complete mathematical solution has never been made. It is not even certain whether our inability to solve this problem completely is due to the lack of sufficient power in the known methods of mathematical analysis, or to the fact that the problem is actually insoluble. Fortunately, astronomers have been able to obtain an approximate solution of the problem as it actually exists in the solar system, and this approximate solution is sufficiently exact for all practical purposes of predicting planetary phenomena. This solution is made by taking advantage of the fact that all the planets in the solar system are very small in comparison with the central body, the sun. The effect of this is to make such planet describe an orbit very nearly the same as the elliptic curve in which it would move if that planet and the sun were the only bodies in the system. Consequently, astronomers can predict planetary phenomena on the assumption that the orbit is a true ellipse, and then calculate the small disturbances or perturbations produced by the gravitational attraction of the other planets in the system. The continuing action of perturbative attraction may in time produce certain changes in the size, shape, and position of an orbit. Suppose, for instance, that in the case of a given planet perturbative action should suddenly cease. Then the planet would go on from that moment in a true elliptic orbit which would never undergo further change. But the ellipse would not be the same ellipse if the perturbative action were to stop to-day as it would have been if that cessation of action had occurred ten thousand years ago. For in that long interval the size, shape and position of the orbit would have been changed appreciably. It follows from these considerations that we may consider perturbative action, if we choose, from the following point of view: We may regard

each planet as traveling for the moment in a certain elliptic orbit, and consider the perturbations as disturbing the orbit instead of the planet itself. Having then deduced from observation the elements (q.v.) of the orbit at a given epoch, we can calculate the changes of the orbit in another epoch, and thus predict the actual motion of the planet for any future time.

The principal planetary perturbations are of several kinds: some change a planet's position on the sky alternately forward and backward every few years (*periodic perturbations*); others require a longer cycle to act forward and backward (*long inequalities*); and lastly there are the *secular inequalities*, whose effects are so slow that hundreds of thousands of years are included in their cyclic action. The planetary periodic perturbations may displace the planets as seen from the sun by 15″ in the case of Mercury, 30″ for Venus, 60″ for the earth, and 120″ for Mars. The most important 'long inequality' is that existing between Jupiter and Saturn. It may displace the former planet 28′ and the latter as much as 48′. The long-period secular inequalities do not alter either the mean distances of the planets from the sun or their periods of revolution. But the nodes (q.v.) and perihelia (q.v.) of the orbits move continuously. The perihelia of all the planets except Venus are gradually increasing their celestial longitudes, and all the nodes are moving in the opposite direction on the ecliptic. At the same time, the inclinations of the planetary orbits to the ecliptic plane are oscillating through narrow limits in very long periods of time and the eccentricities are similarly affected. But, on the whole, the mathematical researches so far made indicate that the continued effect of gravitational perturbative action will not end in the disruption of our solar system. But its permanent existence might be jeopardied by other than gravitational forces, or by forces operating from outside the system. In the case of the moon, perturbations are more complex and larger than they are in the planetary orbits. The moon is so near us that the slightest error in her predicted position is observed with ease and certainty; and therefore her motion offers a much severer test to mathematical calculations than do the planetary phenomena. (See Moon.) Consult Tisserand, *Traité de mécanique céleste* (Paris, 1889-1894).

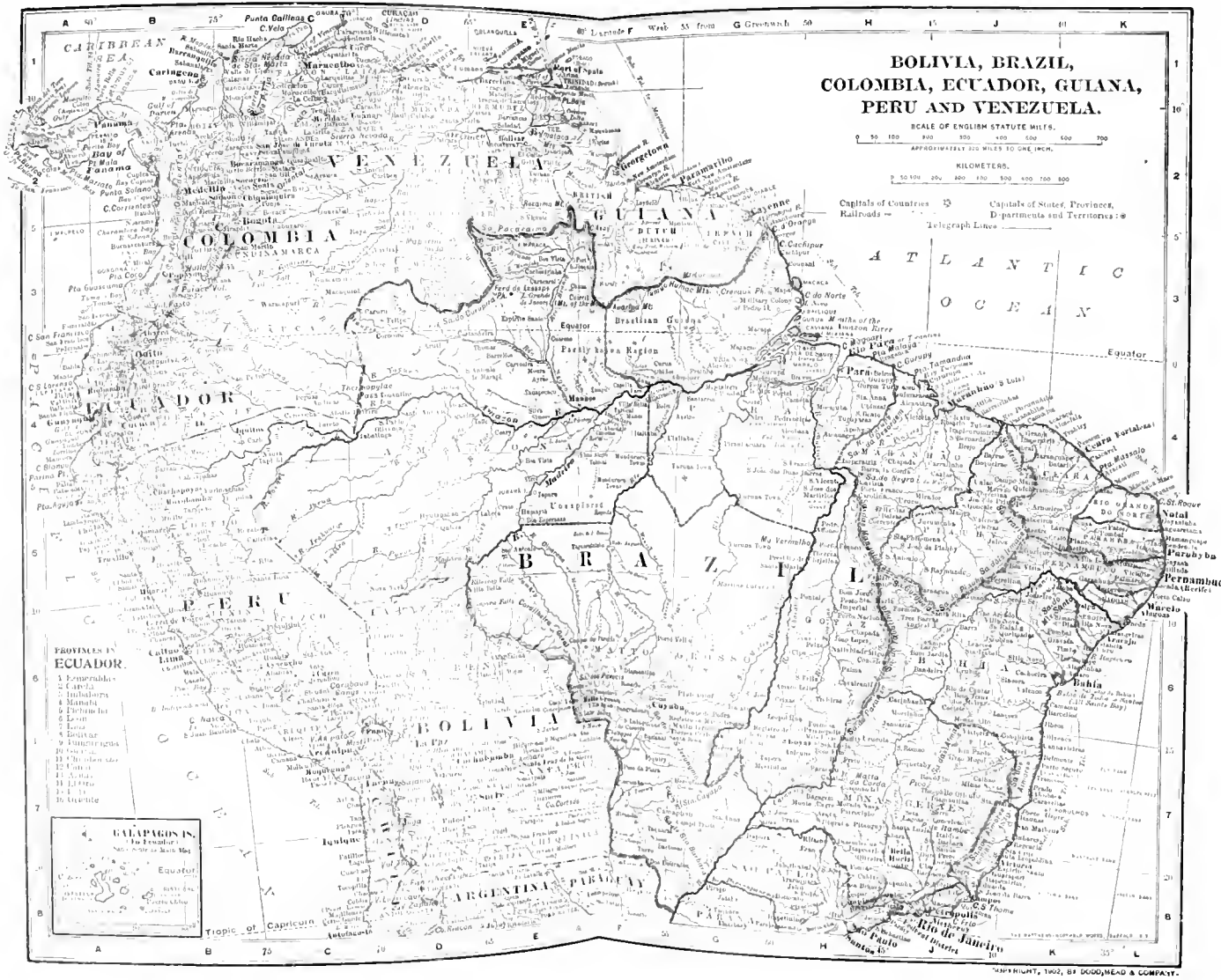
PERTUSSIS. See Whooping Cough.

PERTY, pĕr'tē, Joseph Anton Maximilian (1804-84). A German zoölogist and philosophical writer; born at Ohrban, in Middle Franconia. He studied medicine and natural history at Landshut and Munich; in 1833 became a professor in the University of Bern; and subsequently was made rector. His principal works are: *Allgemeine Naturgeschichte als philosophische und Humanitätswissenschaft* (1837-44); *Die mystischen Erscheinungen in der menschlichen Natur* (2d ed. 1872); *Ueber das Seelenleben der Tiere* (2d ed. 1875); *Blicke in das verborgene Leben des Menschengeistes* (1867); and *Erinnerungen aus dem Leben eines Natur- und Seelenforschers des 19. Jahrhunderts* (1879).

PERTZ, pĕrts, Georg Heinrich (1795-1876). A German historian. He was born at Hanover, studied at Göttingen, and at twenty-four published an authoritative *Geschichte der Merowingischen Hausmeier* (1819). Four years afterwards Pertz was appointed secretary of the royal archives of Hanover and began his important research in mediæval German history as editor of the *Monumenta Germaniæ Historica*. The materials for the Carolingian period were edited personally by Pertz, and an account of his travels and preliminary research was published in the *Archiv der Gesellschaft für ältere deutsche Geschichtskunde* (1824 et seq.). He resigned his post as editor in 1874. Pertz had become librarian and keeper of the Hanoverian archives in 1827, librarian in Berlin in 1842, and had written biographies of Stein (1849-54), and of Count von Gneisenau (1864-69). With Grotefend he edited Leibnitz's works (1843-47).

PERU' (corrupted from *Biru*, name of a chief of the early sixteenth century, who ruled a small territory of South America near the Isthmus of Darien). One of the four countries of South America bordering on the Pacific Ocean. It is bounded on the north by Ecuador, on the east by Brazil and Bolivia, on the south by Bolivia and Chile, and on the west by the Pacific Ocean. Its frontiers on the north, east, and south cannot be exactly defined throughout their whole extent, on account of boundary disputes with Ecuador, Bolivia, and Chile still pending (1903). The coast line, however, is not affected by these disputes except for a comparatively short distance in the extreme south. In 1880 Peru claimed an area of 504,000 square miles, but its claims, according to the Lima Geographical Society, now embrace nearly 700,000 square miles. According to the last census taken (1876) the area was 463,747 square miles. Probably a near approximation to the area is 440,000 square miles actually under the present control of Peru. The length of the coast line conceded to belong to Peru is about 1100 miles, not reckoning sinuosities.

Topography. Extending north and south through Peru are three well-marked topographic divisions: the Coast Desert, the region of the Andes, and the Montaña or tropical forested plain east of the Cordilleras, and included in the basin of the Amazon. The *Zona seca* or dry zone extends along the Pacific coast from 3° S. latitude (Southern Ecuador) through Peru to 22° S. latitude in Northern Chile. Most of this sandy desert is only 20 miles in width, but in the north it is 120 miles wide. It gradually rises from the Pacific to nearly 1000 feet, where it merges with the foothills of the Andes. It is nearly as destitute of vegetation as the African Sahara, except that it is crossed at intervals by rivers, some of them rising among the snow tops of the Central Andes. The banks and valleys of these roughly parallel streams are covered with perpetual vegetation, ribbons of green among the desert waste. Here are many estates and plantations. The desert is whitish in color, owing to the large admixture of marine shells. On the sea margin steep cliffs generally rise, and the waste behind them is slightly undulating, with ridges of considerable height rising here and there. The surface is hard, excepting near the coast, where drifting sea sands are whirled aloft by the winds in clouds of dust. The coast is fairly supplied with harbors well sheltered from the sea; but at many small ports the ships of the coasting trade roll uncomfortably in open roadsteads. The bays of Payta, Sechura, Chimbote,



Callao, Samanco, and Norato are secure, land-locked havens, where the largest vessels may find shelter.

The region of the Andes is about 250 miles in width. It contains enormous chains of mountains, between which are elevated plains and tablelands, warm and fertile ravines and valleys. The mountain system consists of three Cordilleras extending from northwest to southeast, more or less parallel with the line of the coast. The two western chains, for long distances comparatively near each other, are identical in origin and have been separated by denudations in the course of many ages. On these maritime and central Cordilleras are the volcanoes and many thermal springs. Some peaks of the maritime range rise to a height of 15,000 feet. The Sierra, a name that is not applied to any particular cordillera in Peru, designates the region between the maritime and central ranges, rising from 4000 feet, where it abuts on the western, to 10,000 feet at the central mountains. This region, from 50 to 150 miles wide, is a high, broken plain, corresponding to the temperate zone of Mexico, and is best adapted for settlement by whites of the temperate zones. The central range, with culminating peaks 19,000 feet above the sea, is for the most part a distinct water-parting between the Atlantic and Pacific drainage systems, though a few Pacific streams rise to the east of this line of summits. Between the central range and the Eastern Cordillera is the Puna (signifying hard breathing), a broken plain rising from 9000 feet at its western edge to 14,000 feet at the edge of the great Eastern Cordillera of the Andes, where several of the grandest mountains of the continent are found, some of them overlooking the northern plain of Bolivia, rising 20,000 feet. On the Puna rise a number of the great southern headwaters of the Amazon. The Peruvian Andes increase in height from north to south and from west to east.

The eastern part of Peru drops steeply from the cordilleras to the plain of the Upper Amazon, called the Montaña, 800 miles in length, covered with subtropical forests, where it joins the mountains, and with dense tropical vegetation on the plain, which is cut by the eastern frontier. The Montaña is very rich in rubber and agricultural resources, with abundant navigation, and promises to be one of the most prosperous parts of Peru, though it has yet reached only the early stages of development.

Hydrography. The dry west and the rainy east of Peru naturally produce a striking contrast between the hydrographic aspects of the western and eastern slopes of the country. Only feeble streams flow to the Pacific, and most of them are lost in the desert or their waters are wholly diverted to nourish the plantations. None of them flows perennially to the Pacific excepting the Santa, which rises, not on the western slopes of the mountains, like most of the coast rivers, but in a long valley between the maritime and central ranges. During the flood the Santa discharges such an enormous quantity of water that it is difficult to cross. Most of the coast rivers are quite short, and their great value is derived wholly from the facilities they afford, by means of irrigation, for turning belts of the desert into the most fertile of lands. The more important among them, from north to south, are the Chira, the Piura, the Santa, the Rimac, which created the fertile plain on which Lima stands, and the Rio Grande.

The Amazonian affluents of the eastern slope, on the other hand, constantly increase in volume with distance from their sources. The rivulets among them carry more water than most of the Pacific streams. The upper parts of these rivers are interrupted by cascades and rapids, and thus the economic periphery of Eastern Peru is largely determined by the line joining the heads of navigation on these many rivers. All the very numerous rivers of the eastern slope of Peru are included in the Amazon basin, and belong to one or another of the three secondary basins of the Marañón, the Huallaga, and the Ucayale, which are entirely in Peruvian territory, besides a few tributaries of the Purus and Madeira. The Marañón is usually regarded as the main upper branch of the Amazon, not because it carries so much water as the Ucayale, but because it prolongs farthest toward the Pacific the longitudinal axis of the Amazon. Ocean steamers now regularly ascend the Amazon and Marañón to Iquitos, Peru, 3000 miles from the Atlantic, and light-draught steamers prolong navigation for 825 miles up the Ucalaye, Pachitea, and Pichis rivers. There are no important lakes excepting Titicaca (q.v.), which lies partly in Bolivia; it is 12,500 feet above sea-level, and affords navigation between Peruvian and Bolivian ports on its shores.

Climate. The chief determining influences on the climate are the trade winds and the great differences in elevation. The country is more temperate than might be expected from its position in the tropics. The trade winds coming west from the Atlantic deluge the eastern mountains, drop cold rain and snow upon the Puna, give a smaller supply of water to the central range, and moisten the plain of the Sierra to some extent. So little water is left for the maritime range that it is included with the coastal desert in the dry belt. These facts explain the aridity of the west slope of Peru. Once in seven or eight years a marvelous change comes over the face of this desert. Sufficient rain comes over the mountains to bring life out of the parched surface: grass and flowering plants appear, attracting thousands of cattle and goats from the irrigated valleys to the new pasturage, which withers again in a few weeks. Only about 1½ inches of rain fall in Lima in a year. The mean annual temperature of the coast provinces is 68° F. In the hottest months, January and February, the mean temperature is between 82° and 86°. The dry heat is not oppressive; and after 11 A.M., when the torrid sun has rarefied the atmosphere over the desert, sea air comes rushing to this area of low pressure, all life is refreshed by the breeze, and often a little rain is scattered over the maritime range. In the evening, when the surface of the desert grows cool, the wind sets to sea again, bringing cool breezes from the mountains. Conditions are nowhere unhealthful excepting in the low, hot plains of the north and east. The whole mountain region lying between 3000 and 9000 feet above the sea has a temperate and healthful climate. Thus in nearly all parts of Peru the climate is exceptional.

Flora. Varying with the climate, the flora of Peru is represented on the dry coast only by a few gray herbs and in the depressions by the Prosopis, a low tree of scraggy growth, and two

stigas, the Capparis and a variety of Apocynum. The western slopes of the maritime range, exposed to fogs and occasional rains, have sufficient vegetation to give them a green aspect mixed with yellow due to the abundance of yellow marguerites. The high plateaus among the mountains have a great variety of species, among which resinous and other herbs and the gigantic cactus are especially abundant, and several varieties of forest trees are found. The flora of every zone is represented among the mountains, from the tropical in the deep gorges to the Arctic approaching the snow line. The potato thrives and the llama, vicuña, and sheep feed on the grasses of the uplands. The most valuable plants, economically, are the quinine-yielding cinchona, the coca plant, from which cocaine is derived, the Siphocampylus, a plant 50 feet high, from which Peruvian rubber is extracted, and the sarsaparilla.

Fauna. The headlands of the coast and the neighboring islands are the home of myriads of sea birds, whence came the immense deposits of guano that were long a great source of Peruvian wealth. Among them are the guano bird (*Sula variegata*), a large gull (*Larus modestus*), a tern (*Sterna inca*), and several cormorants. Sea-lions (*Otaria forsteri*) are common on the promontories and islands. The domesticated llama and alpaca and the wild vicuña belong especially to the mountain regions; among the other animals of the highlands are the tarnco, a deer, the viscacha, a large rodent, the atoc, a species of fox, the puma, and two species of bear. The largest bird is the condor; another bird of the vulture family whose black and white wing feather was used by the Incas in their headdress is the coraquenque. Woodpeckers, a species of partridge, geese, a plover, two kinds of ibis, gulls, water hens, finches, and parrots are also found. Nearly all the characteristic animals of tropical South America are found in the Montaña, including monkeys, the tiger cat, jaguar, tapir, peccary, tortoise, alligator, manatee, snakes, and vipers.

Geology and Mineral Resources. Sections of the desert zone, exposed along the coast and valleys for several hundred feet, reveal nearly horizontal layers of calcareous sandstone above strata of pudding stone and shell marl, beneath which are beds of argillaceous shale, considerably tilted and often of immense thickness. The ridges found on the coast plain are of granite or syenite. The Maritime and Central Cordilleras consist chiefly of crystalline and volcanic rocks on each side of which are sedimentary strata, principally of Jurassic age. The Eastern Cordillera is in great part of Silurian formation, with talcose and clay slates, many quartz veins, and intrusions of granite rocks. The igneous cones of Peru are found in the southern section of the maritime and central ranges, about 1200 miles south of those in Ecuador. None of them has been in eruption in recent times. Sara-Sara, Achatayhua, Coro Puna, Ampato (all over 13,000 feet), Chachani (19,820 feet), and Misti (about 20,000 feet) are quiescent and snow-clad. Misti, a magnificent cone, near whose base stands the city of Arequipa, appears to be the focus from which some of the earthquakes that afflict Peru have been propagated. South of Misti is the elongated crest of the volcano of Omate, in the seventeenth century the most active of the Peruvian volcanoes. Farther south is Tutupaca (18,960 feet), which as late as 1862 was still ejecting vapors by which a little sulphur was deposited. The frequent and severe earthquakes are most destructive in the neighborhood of these southern volcanoes. In 1746 Callao and in 1868 Arequipa were destroyed by earthquakes. The shocks of 1877 were equally severe, and all the southern ports were overwhelmed by earthquake waves.

Peru is a vast storehouse of mineral wealth, though it long ago lost the first rank as a mining country, and is now surpassed even by Bolivia and Chile. The Eastern Cordillera contains gold in the quartz veins of the Silurian strata, but the annual yield is small because the richest mines occur in the most unhealthful and remote parts of the Montaña, where miners dislike to go, and transportation is very difficult. The Central and Maritime Cordilleras are poor in gold, but rich in silver, which occurs nearly always with antimony, copper, and lead. Copper is found in greatest abundance in the coast lands, where also are important areas of salt, borax, and petroleum (in Piura). Anthracite and bituminous coal are reported in the province of Hualgayoc and are known to exist in the Huamachuco and other districts. But silver remains the chief mineral product. The greatest centre of the industry is at Cerro de Pasco, which produced $475,000,000 of silver between 1630 and 1849, and has yielded an average of about 1,200,000 ounces a year for the past ten years, dropping, however, to 1,000,000 ounces in 1901, owing to the inundation of some of the chief mines, which will be drained by a tunnel. Other important silver-mining centres are those around Puno, and at Caylloma, Castrovireina, and Recuay. United States and British companies are largely interested in the mining industry, and the number of mines increased from 1456 in 1886 to 3475 in 1897. In 1900 there were 5178 mining claims, including silver, gold, copper, quicksilver, lead, zinc, coal, sulphur, salt, and petroleum. Many of these claims are unworked.

Agriculture. The chief crops of the fertile coast valleys are sugar, cotton, and coffee. In 1903, 370,650 acres of these irrigated lands were in sugar-cane, which is grown to perfection, 12.5 tons of cane yielding a ton of sugar, the great export crop, and the basis of agricultural prosperity. The unoccupied land capable of producing sugar is measurable only by the possibilities of irrigation. Cotton is indigenous, and that grown in the northern provinces is distinctive (tree cotton), the plant often reaching a height of 20 feet and producing for 7 to 10 years, the fibre ranging in color from pure white to dark brown. This cotton is especially valued for mixing with fine wool, to which it adds strength, lustre, and protection against shrinkage. Its value is greater than that of any other cotton excepting American sea island. The ordinary staple grown in the coast valleys farther south is adapted for spinning fine yarns. Extensive irrigation works both north and south are now being developed to enlarge the area of cotton culture, and the product is steadily increasing. Rice and tobacco are important crops, and there are several large establishments for the preparation of rice for market. Maize and alfalfa (lucerne), vegetables, and fruits of all kinds are cultivated in every valley. Grape culture is increasing, and the production of wine is impor-

tant. Olives are grown in the south, and there are many profitable grazing farms in the coast valleys. In the valleys and to some extent on the plateaus of the Andean region wheat and barley ripen, the potato is a very successful crop, and the cultivation of coffee is a growing industry. The cultivation of the cacao-tree is especially successful in the valley of the Pérené River in the Montaña, where 200,000 trees were recently added to the plantations. In 1901, 107 tons of cacao were exported. Over 1500 tons of rubber are annually shipped from the Montaña, whose other chief products are cinchona, dyes, and medicinal substances, all the exports going down the Amazon from Iquitos. The coca-tree thrives best near the Pacific, in the Department of La Libertad, where in 1901 there were 2,700,000 trees, the exports being 610 tons of coca and 10.69 tons of cocaine.

MANUFACTURES. The manufacturing industries have as yet little importance, though some progress is being made. Five cotton factories operate 1400 looms, but they supply only a small part of the cotton cloths required. Beer, boots and shoes, wine, clothing, furniture, watches, soap, lard, saddlery, olive oil, and cottonseed-oil cake are among the other products, Callao and its environs being the chief centre of production. The Indians of the north make fine straw hats, which enter the trade as Panama hats, though the name is properly applied only to the product of Ecuadorian natives. Indians on the mountain plateaus make coarse woolen fabrics and earthenware for local consumption; and a few coast towns produce filigree and other fancy articles. The quantity of petroleum refined is not large. Owing to the small variety and quantity of home manufactures, it is necessary to import a great deal of machinery and wares of all kinds.

COMMERCE. Peru's business relations with foreign countries have been steadily increasing in recent years. The following table shows the progressive growth in the value of international commerce for six years:

	1896	1897	1898	1899	1900	1901
Exportation	$6,113,678	$6,760,428	$7,265,945	$7,374,218	$10,795,198	$10,316,109
Importation	4,201,234	3,870,874	4,611,540	4,496,486	5,561,160	6,619,737
Total	$10,314,912	$10,631,302	$11,877,485	$11,870,704	$16,356,358	$16,935,846

The following table shows the progressive increase in metric tons in the exports of the ten principal products of Peru for the same period:

ARTICLE	1896	1897	1898	1899	1900	1901
Cotton	4,718	5,586	6,712	5,876	7,246	8,011
Rice	2,804	4,222	4,276	2,874	4,260	4,164
Sugar	71,735	105,463	105,713	103,706	114,222	114,637
Cocoa		12	62	54	99.3	107
Coffee	714	1,240	1,245	1,215	1,154	946
Coca leaves		497	430	312	566	610
Cocaine		4.2	4.35	4.5	7.75	10.6
Leather	1,332	1,710	2,127	2,062	2,286	2,251
Wool	2,544	3,770	3,189	3,434	3,534	3,856
Minerals	12,000	15,000	17,225	23,158	39,405	46,885

In the sugar trade, Peru has the great advantage that the fields are cheaply irrigated and the absence of rain permits grinding for three-fourths of the year. Raw sugar is therefore produced at small cost. About five-sixths of the crop is exported, Great Britain, the United States, and Chile being the largest buyers. The distinctive qualities of Peruvian cotton create a demand for it in the leading woolen centres of this country and Europe. Coffee exports are not expanding, because most of the plantations are on the Andes slopes and transportation by mule train to the railroads is very expensive.

The principal imports and exports in 1900, in dollars, were:

IMPORTS	1900
Cottons	$1,806,285
Woolens	725,680
Other tissues	332,545
Furniture, etc	845,810
Small wares, etc.	5,884,075
Provisions, etc	1,264,515
Wines, etc	227,920
Drugs, etc	485,770

EXPORTS	1900
Ores	$8,475,275
Sugar	7,279,210
Wool	1,483,365
Cotton	1,630,370
Coffee	327,155
Borax	283,185
Hides	542,790
Rice	319,515
Cocaine	580,890

The distribution of trade to the leading countries in 1900 was:

FROM OR TO	Imports	Exports
United Kingdom	$5,405,725	$10,446,340
Germany	1,802,995	2,579,965
United States	1,487,180	4,774,480
France	781,745	702,340
Chile	457,066	3,052,600

The trade with the United States for five years was as follows: Exports from Peru in 1898, $714,247; 1899, $1,496,978; 1900, $4,774,480; 1901, $3,656,180; 1902, $3,269,411; and imports into Peru in 1898, $1,302,697; 1899, $1,325,650; 1900, $1,487,180; 1901, $3,126,934; 1902, $2,558,995.

The chief articles which Peru sold to the United States in the fiscal year 1902 were: Raw sugar (including some molasses), $2,126,686; cotton, $592,509; gold bars and concentrates, $469,772; goat skins, $265,798; coca leaves, $175,552; straw hats, $65,385; sulphide of silver, $52,745; silver ore, $36,595; rubber, $36,644; alpaca wool, $21,728; guano, $8,750. The chief

principal imports from the United States were hardware, machinery, breadstuffs, and provisions.

Transportation and Communications. Foreign vessels call at nearly every port, but most of the international trade is conducted through the port of Callao. The vessels of over 50 tons entering that port in 1901 numbered 531, of 755,461 tons; the clearances were 537 vessels, of 753,334 tons. There entered also 959 vessels under 50 tons, of 12,697 tons. About one-half of the tonnage of foreign vessels was British. The steamships of the Pacific Steam Navigation Company, on the route between Chile and San Francisco, call at nearly all the Peruvian ports. Very little freight is carried in domestic bottoms, the merchant marine of the country in 1902 consisting of only 1 steamer of 19 tons, 29 sailing vessels of 50 tons, and 86 under 50 tons, the aggregate tonnage being 10,629 tons.

Good wagon roads and bridges are among Peru's greatest needs. Western Peru is still almost isolated from the Montaña because the road on which a vast sum has been spent to connect Oroya, the terminus of the Central Railroad with the Pichis River, the head of navigation leading to Iquitos, is not yet in a satisfactory condition. Freight between Oroya and the great mining centre of Cerro de Pasco, 66 miles, is still carried by llamas, horses, and mules.

Peru in 1902 had 1035 miles of railroad in operation, of which 844 miles were worked by the Peruvian Corporation, which manages all the property turned over in liquidation of the national debt. Not only Lima, but also the larger inland towns are connected by rail with their seaports, but the country needs branches extending north and south to connect the Andean towns with the routes to the sea and with one another. Peru thus has numerous sections of a railroad system, but, owing to the lack of branches between them, the railroads are as yet wholly inadequate for the needs of the country. The greatest railroads are the line from Callao and Lima across the Maritime and Central Cordilleras to Oroya, 136 miles long, with 63 tunnels, enormous bridges, embankments, and cuttings, and a tunnel in the mountains at an altitude of 15,645 feet, the most elevated spot reached by any railroad in the world; and the railroad between the port of Mollendo and Puno on Lake Titicaca, on which there is a connection by steamers with Bolivia. The gross receipts in 1901-02 from railroads and steamers amounted to $2,508,875; the working expenses were $1,619,135. The State owns 1400 miles and the Peruvian Corporation 533 miles. There are 48 telegraph offices, and in 1901 152,808 telegrams were sent. Electric communication with the rest of the world is supplied by the cables along the coast, with stations at Payta, Callao, Lima, and Mollendo. There are 369 post-offices, which in 1900 carried 8,884,604 letters, etc.

Banking. The four commercial banks of Peru are the Bank of Peru in London (paid up capital and reserve fund, £1,058,050); the Italian Bank (paid up capital and reserve fund, $362,388); the International Bank of Peru (capital and reserve, $362,388); and the Banco Popular (capital and reserve fund, $362,388). The only savings bank had deposits in 1902 amounting to over $750,000.

Education. The municipalities maintain free public schools; elementary education is compulsory for both sexes. In 1898 there were 1544 primary schools, with 91,853 pupils. The number of teachers in the primary schools was 1991, the cost of maintaining the schools being $241,790; 2168 pupils attended the high schools maintained by the Government at the capitals of the departments. The University of San Marcos had 650 students, and faculties of jurisprudence, literature, medicine, political science, and theology. There are also universities with very small attendance at Arequipa, Cuzco, and Trujillo. A few high schools are under the direction of European teachers, and Lima has a school of mines and civil engineering and a public library.

Religion. The religion of the State is Roman Catholic, and the Constitution prohibits the public exercise of any other religion; practically, however, there is considerable toleration, and Callao, Lima, and Cuzco have Protestant churches and missionary schools. The non-Catholic population probably does not number over 30,000.

Finance. The public revenue is chiefly derived from the customs and the direct taxes levied by the departments and municipalities on rent derived from real estate. Among the other sources of revenue are the salt monopoly and the postal and telegraph services. The revenue in 1901 amounted to $7,739,307; expenditures, $7,208,626. In 1902 the expenditure was distributed as follows: Congress, $213,485; Ministry of Interior, $1,676,732; Foreign Affairs, $342,190; Justice, $724,520; Finance, $2,612,965; War and Marine, $1,926,615; Public Works, $387,260; total, $7,883,770.

Owing largely to her war with Chile, Peru was enormously in debt, her bonds being held in England to the amount of £31,579,080. Though the two loans represented by this total were secured by the guano deposits and the general resources of the country, no interest was paid on the public debt after 1876, and the arrears in 1889 amounted to £22,998,651. In 1890 Peru was released from all responsibility for the two loans, and all the railroads and rights over guano deposits, mines, and lands were ceded to the bondholders for 66 years. The Government agreed to pay $400,000 annually to the Peruvian Corporation, which was to carry on railroad building. Disputes as to the fulfillment of these conditions on both sides have not yet been settled. The internal and floating debt of Peru amount to £4,759,000, of which £2,660,645 bears interest at the rate of 1 per cent. per annum.

Money, Weights, and Measures. Peru adopted the gold standard in 1901. Both the pound sterling and the national gold coin, the libra, which is of the same standard and weight, are legal tender. Silver is legal tender up to 100 soles. The sol is worth 49 cents. Spanish standards of weight and measure are still in use, though the French metric system was established by law in 1860, and is employed in the custom houses.

Population. There has been no census since 1876, when the number of the population was given at 2,660,881, of whom about 13.8 per cent. were white, 1.9 negroes, 57.6 Indian, 24.8 mixed bloods, and 1.9 Asiatic, chiefly Chinese. The Lima Geographical Society in 1896 estimated the population at 4,609,999. The estimate is believed to be excessive. To all appearances the population is increasing very slowly, if at all. Immigration

from Europe, which is promoted by the Peruvian Corporation, is very small.

The list of departments, with their capitals and population (estimated in 1896), is given as follows:

DEPARTMENTS	Population 1896	Capitals
Piura	213,909	Piura
Cajamarca	442,412	Cajamarca
Amazonas	70,676	Chachapoyas
Loreto	100,596	Moyobamba
La Libertad	250,931	Trujillo
Ancachs	428,703	Huaraz
Lima	298,106	Lima
Callao	48,118	Callao
Huancavelica	223,796	Huancavelica
Huánuco	145,309	Huánuco
Junin	304,393	Cerro de Pasco
Ica	90,962	Ica
Ayacucho	302,469	Ayacucho
Cuzco	438,646	Cuzco
Puno	537,345	Puno
Arequipa	229,007	Arequipa
Moquegua	42,694	Moquegua
Apurimac	177,387	Abancay
Lambayeque	124,091	Lambayeque
Total	4,559,550	

GOVERNMENT. For political purposes the Republic of Peru is divided into 17 departments and 2 provinces (Callao and Moquegua), and these departments in turn are subdivided into 90 provinces. The present Constitution, based on that of the United States, was proclaimed in 1856 and revised four years later. Under it the executive power is vested in a President, who must be thirty-five years of age, and a native Peruvian, elected by direct vote for four years, and two Vice-Presidents elected for the same period. The President is ineligible for two consecutive terms. He is assisted by six responsible ministers, who hold office at his pleasure, but whose signature is necessary to validate his acts.

The legislative power is vested in a Senate of 48 members and a Chamber of Deputies of 108. The Senators, with the same age and residence qualifications as the President, are elected by departments, the number varying from one to four, according to the number of provinces in the department. The Deputies, Peruvians by birth and citizens of good standing, are elected in the proportion of one for every 30,000 inhabitants or majority fraction, though each province is entitled to one representative even if its population is less than 15,000. Senators must have an annual income of $1000 and Deputies of $500, or have a scientific profession. They are elected indirectly by provincial electoral colleges and serve six years.

The judicial power is vested in a Supreme Court of Justice, whose members are elected by Congress from names submitted by the President; superior courts in each department, whose members are appointed by the President; and judges of first instance in each province and local justices in each municipality, appointed by the judges of the superior courts. The conduct of all trials must be public. The executive and police powers of the Republic depend directly upon the President, who appoints the prefects of the various departments and the sub-prefects, who control the provinces. The districts are under Governors appointed by the prefects, and the municipalities under Lieutenant-Governors appointed by the sub-prefects. All police officials hold directly from the President. Citizenship is restricted by educational and property qualifications. The capital of the Republic is Lima.

ARMY AND NAVY. The army is to be reorganized. It numbers some 4000 men on a peace footing. There is a new military academy near Lima. The navy has four small vessels in more or less bad condition.

HISTORY. Little is clearly ascertainable regarding the early history of the Peruvian Empire, and the lists given of its early sovereigns are by no means to be trusted. Almost all we know of their early history is derived from the traditions of the people, collected by the early Spaniards. (See PERUVIAN ANTIQUITIES.) In 1453 Tupac Inca Yupanqui, the eleventh Inca, according to the list given by Garcilaso de la Vega (q.v.), greatly enlarged his widespread dominions. He led his armies southward into Chile, marched over the terrible desert of Atacama, and, penetrating as far south as the River Maule, fixed there the southern boundary of Peru. While thus engaged, his son, the young Huayna Capac (q.v.), heir to the fame as well as the throne of his father, had marched northward to the Amazon, crossed that barrier, and conquered the Kingdom of Quito. In 1475 Huayna Capac ascended the throne, and under him the Empire of the Incas attained to its greatest extent, his sway extending from the valley of the Amazon to Chile and from the shores of the Pacific to the sources of the Paraguay.

About the year 1516, and ten years before the death of Huayna Capac, the first white man had landed on the western shores of South America; but it was not till the year 1531 that Pizarro (q.v.), at the head of a small band of Spanish adventurers, actually invaded Peru. On his death-bed the great Inca had expressed a wish that the Kingdom of Quito should pass to Atahualpa (q.v.), one of his sons by a princess of Quito, and that all his other territories should fall to his legitimate son, Huascar, the heir to the crown, and who, according to the custom of the Incas, should have inherited all its dependencies. Between these two princes, quarrels, resulting in war, arose; and when Pizarro entered Peru he found the country occupied by two rival factions. Atahualpa had completely defeated the forces of his brother, had taken Huascar prisoner, and was now stationed at Caxamalca, on the eastern side of the Andes, whither, with a force of 102 foot soldiers and 62 horsemen and two small falconets or cannon, the dauntless Spanish leader, in September, 1532, set out to meet him. Shortly after the execution of Atahualpa (August, 1533) at Caxamalca the invaders set out for Cuzco. Their strength had been increased by reënforcements, and they now numbered nearly 500 men, of whom about a third were cavalry. They entered the Peruvian capital November 15, 1533, having in the course of their progress toward the city of the Incas had many sharp encounters with the Indians, in all of which their armor, artillery, and cavalry gave them the advantage. At Cuzco they obtained a vast amount of gold, the one object for which the conquest of Peru was undertaken. As at Caxamalca, the articles of gold were for the most part melted down into ingots, and divided among the band. After stripping the palaces and temples of their treasures, Pizarro placed Manco,

a son of the great Huayna Capac, on the throne of the Incas. Leaving a garrison in the capital, he then marched west to the seacoast, with the intention of building a town, from which he could the more easily repel invasion from without, and which should be the future capital of the kingdom. Choosing the banks of the river Rimac, he founded, about six miles from its mouth, the *Ciudad de los Reyes*, 'City of the Kings.' Subsequently its name was changed to Lima, the modified form of the name of the river on which it was placed. The Inca Manco succeeded in effecting his escape, and headed a formidable rising of the natives. Gathering around Cuzco in immense numbers, the natives laid siege to the city, and set it on fire. The city was relieved by the failure of provisions among the besiegers and the departure of the Peruvians for their farms. The advantages, many, though unimportant, which the Inca gained in the course of this siege, were his last triumphs. He afterwards retired to the mountains, where he soon after perished. More formidable, however, to Pizarro than any rising of the natives, was the quarrel between himself and Almagro (q.v.), a soldier of generous disposition, but of fiery temper, who, after Pizarro, held the highest rank among the conquerors. Civil war ensued in which Almagro was defeated and put to death. His followers, however, plotted revenge, and in 1541 Pizarro fell beneath their swords. The son of Almagro then proclaimed himself Governor, but was soon defeated in battle and put to death. In 1542 a council at Valladolid in Spain, called at the instigation of the ecclesiastic Las Casas, who deplored the cruelties committed on the natives, framed a code of laws, known as the 'New Laws for the Indies,' for Mexico and Peru, according to which the Indians who had been enslaved by the Spaniards were virtually declared free men. It was also enacted that the Indians were not to be forced to labor in unhealthy localities, and that whenever they were desired to work in any particular locality they were to be fairly paid. Blasco Nuñez Vela, sent from Spain to enforce the new laws, rendered himself unpopular, and was seized and sent back to Panama. He had come from Spain accompanied by an *audiencia* of four, who now undertook the government. Gonzalo Pizarro (q.v.) was induced to declare himself Captain-General of Peru and marched upon Lima. He was too powerful to withstand, and the audiencia elected him Governor as well as Captain-General of the country. Pizarro was overthrown by Pedro de la Gasca and put to death in 1548.

A series of petty quarrels and the tiresome story of the substitution of one ruling functionary for another make up a great part of the history of Peru during the next two centuries. The country became one of the four viceroyalties of Spanish America, and the Spanish authority was fully established and administered by successive viceroys. The Province of Quito was separated from Peru in 1718, and in 1788 considerable territories in the south were detached and formed into the Government of Buenos Ayres. At the outbreak of the War of Independence in South America, Spain, which had declined greatly in internal strength, was distracted by the French invasion and the dissensions of a regency; nevertheless in July, 1816, when the Viceroy Abascal turned over his office to Don Joaquin de la Pezuela, there was a Spanish army of 23,000 men in Peru and all resistance had apparently been stamped out in Chile, Upper Peru (Bolivia), Quito, and New Granada, Buenos Ayres alone maintaining her independence. Peru was the last of the Spanish South American possessions to set up the standard of independence. In August, 1820, an army under General San Martin, one of the liberators of Chile, landed at Lima, and, after a number of successes both on sea and land, in which the patriots were effectively assisted by Lord Cochrane, General Miller, and other English volunteers, the independence of the country was proclaimed at Lima, July 28, 1821. San Martin assumed the protectorate of the young Republic. By the spring of 1822 he had forced the surrender of the last large body of Spanish troops. At this juncture General Bolivar (q.v.), flushed with his successes in the north, landed at Guayaquil. San Martin, recognizing the dangers of rivalry, arranged a meeting on July 26, 1822, the details of which were never made public, but as a result of which San Martin resigned, and, a year later, retired to England. A Congress was summoned, and on February 28, 1823, Don José de la Riva Aguero was installed as the first President of Peru. Meanwhile the scattered bands of Spanish royalists had managed to collect in the south, around Cuzco, and the agents of Bolivar succeeded in persuading the Congress to depose Riva Aguero. On September 1, 1823, Bolivar landed at Callao and devoted himself to organizing an army. On February 10, 1824, he was appointed supreme dictator by the Congress. For a while the royalists under Canterac made considerable headway, occupying Callao Castle and forcing Bolivar to evacuate Lima. The two armies met on the plains of Junin, where a remarkable battle was fought in which the Peruvian cavalry turned defeat into victory by repeated charges with their lances. The Spaniards retired to Cuzco, where the Viceroy, La Serna, concentrated his forces for a final stand. On December 9th a battle was fought at Ayacucho in which the patriots, under General Sucre, were completely successful, and the Spanish officials and generals, with over three thousand soldiers, surrendered. The guerrilla fighting continued for a while in the north, where General Olañate stubbornly held out until shot by his own troops in April, 1825. In 1826 the Spaniards evacuated Callao and the war was at an end. Bolivar, on February 10, 1825, resigned the dictatorship, but was immediately reappointed, and remained in control of the Government until March, 1827, when he returned to Colombia with his soldiers. On June 4, 1827, a congress met and framed a provisional Constitution, adopted in 1828. General Lamar was elected President. Lamar promptly forced a quarrel with Bolivar, who declared war and defeated him, enforcing a money indemnity and the surrender of Guayaquil. The history of the next thirty-five years is the record of repeated changes in Government, one man after another gaining a personal ascendency, lasting a few days or years, until some rival took advantage of his mistakes to supplant him. Withal, the state of the country gradually improved, commercially, socially, and intellectually, but with few events of especial interest or importance.

In April, 1864, a Spanish squadron seized the

Chincha Islands in reparation for injuries sustained by Spanish subjects. President Pezet was unwilling to risk a war with Spain, and a treaty of peace was signed in January, 1865. The action of the President aroused bitter opposition in the country; he was declared a traitor by the Assembly, and in February a revolution broke out which ended in the overthrow of Pezet and the proclamation of Mariano Ignacio Prado as dictator (November 26, 1865). An alliance against Spain was concluded with Chile, Ecuador, and Bolivia, war being declared in January, 1866. On May 2, 1866, a Spanish fleet bombarded Callao, but was compelled to withdraw. This marked the termination of hostilities. In 1879 Peru as the ally of Bolivia became involved in war with Chile. (See BOLIVIA; CHILE.) In October, 1879, the Peruvian man-of-war *Huascar* was captured by the Chilean fleet, and on November 19th the forces of Bolivia and Peru were overwhelmed at Dolores. A Chilean army under General Baquedano captured Moquegua and Tacna, two important cities in Southern Peru, in March and May, 1880. Early in June the same general carried the almost impregnable stronghold of Arica by storm, thus gaining possession of the whole of Southern Peru. In the meantime the Chilean fleet was blockading or pillaging the Northern Peruvian seaports. The Peruvians refusing to accede to the terms for peace dictated by Chile, Baquedano organized an expedition against Lima. This expedition started in November, by water, and landed at Pisco and Curayaco, about 200 miles south of Lima. With an army 30,000 strong, the Chilean general marched on the capital, spreading devastation along the way. The Peruvians were defeated at Chorillos on January 13, 1881, and at Miraflores on January 15th, and on January 17th the Chileans made their entry into Lima. Capt. Patrick Lynch, the leader in a raid which had devastated the northern coast towns, was appointed Chilean commandant of the town. After the fall of Lima desultory fighting continued until a treaty of peace was concluded, October 20, 1883. Peru ceded to Chile the District of Tarapacá and the Territories of Tacna and Arica for a term of ten years; the people of these territories to decide by popular vote whether they wished to return to Peru or to remain under Chilean rule. This term was further extended, Chile apparently distrusting the result of the plebiscite, and the territory has become practically Chilean. The war left Peru in a shattered and bankrupt condition, from which it has very slowly recovered. Boundary disputes, especially with Chile, have arisen periodically to threaten the peace relations.

BIBLIOGRAPHY. Rivero and Tschudi, *Peruvian Antiquities* (New York, 1853); Tschudi, *Untersuchungen über die Fauna Peruana* (Leipzig, 1844-46); Fajardo, *Tratado de geografia fisica politica y descriptiva de la república peruana* (Lima, 1861); Grandidier, *Voyage dans l'Amérique du Sud, Pérou et Bolivie* (Paris, 1861); Menendez, *Manual de geografia y estadistica del Perú* (Paris, 1862); Paz Soldan, *Geografia del Perú* (ib., 1862); id., *Diccionario geográfico estadistico del Perú* (Lima, 1879); Hill, *Travels in Peru and Mexico* (London, 1860); Lopez, *Les races aryennes du Pérou* (Paris, 1871); Tschudi, *Reisen durch Südamerika* (Leipzig, 1866-69); Bollaert, *Antiquarian, Ethnological, and Other Researches in New Granada, Ecuador, and Peru* (London, 1860); Hutchinson, *Two Years in Peru with Explorations of Its Antiquities* (ib., 1874); Raimondi, *El Perú* (Lima, 1874-76); Carrey, *Le Perou* (Paris, 1875); Squier, *Observations on the Geography and Archæology of Peru* (London, 1870); id., *Peru* (ib., 1877); Falb, *Das Land der Inka* (Leipzig, 1883); Markham, *The War Between Peru and Chile, 1879-81* (London, 1883); De las Casas, *De las antiguas gentes del Perú* (Madrid, 1892); Middendorf, *Peru* (Berlin, 1893); Reclus, *Nouvelle géographie universelle*, vol. xviii. (Paris, 1893); Cisneros and Garcia, *Geografia comercial de la América del Sud* (Lima, 1897); id., *El Perú en Europa* (ib., 1900); Haënke, *Descripción del Perú* (ib., 1901); "Biblioteca Peruana," in *Biblioteca del Instituto Nacional* (Santiago, 1896). For history, consult: Fuentes (ed.), *Memorias de los virreyes que han gobernado el Perú* (Lima, 1859); Odriozola, *Documentos históricos del Perú* (ib., 1863-64); Prescott, *History of the Conquest of Peru* (Philadelphia, 1868); Markham, *History of Peru* (London, 1892).

PERU'. A city in Lasalle County, Ill., about 60 miles north-northeast of Peoria; at the head of navigation on the Illinois River, on the Illinois and Michigan Canal, and on the Chicago, Rock Island and Pacific Railroad (Map: Illinois, C 2). Picturesquely situated, it has a public square and public parks, and is the seat of Saint Bede College (Roman Catholic), opened in 1891. Among the prominent buildings are Turner Hall and the Masonic Building. There are four bridges here, including a fine railroad bridge. Peru is the centre of valuable bituminous coal fields and of extensive deposits of cement rock and white sand rock. Its industrial establishments include large zinc-rolling mills and furnaces, a foundry and machine shop, scale works, plow and wheel works, clock works, breweries, grain elevators, nickeloid works, a planing mill, and fertilizer works. The government is administered under a charter of 1890, by a mayor elected every two years, and a council. The water-works and the electric light plant are owned and operated by the municipality. Peru was first settled in 1827 and laid out in 1834. In 1852 it was chartered as a city. For the archæologist, the vicinity presents much interest, as there are relics of the Mound Builders. Population, in 1890, 5550; in 1900, 6863.

PERU. A city and the county-seat of Miami County, Ind., 75 miles north of Indianapolis; on the Wabash River, and on the Wabash, the Lake Erie and Western, and the Cincinnati, Richmond and Muncie railroads (Map: Indiana, C 2). Five bridges span the river at this point. The city has a public library, the Wabash Railroad Hospital, a sanatorium, and Boyd Park. It derives considerable trade from the tributary country, which is largely agricultural. There are railroad shops of the Erie, and of the Cincinnati, Richmond and Muncie, carbon works, woolen mills, basket factory, bagging mills, glass works, steel works, a cabinet factory, wagon shops, a candy factory, etc. Peru, incorporated in 1848, is now governed under a charter of 1868 which provides for a mayor, elected biennially, and a council. There are municipal water-works and a municipal electric light plant. Population, in 1890, 7028; in 1900, 8463.

PERU BALSAM. See BALSAM.

PERUGIA, pā-rōō'jä. The capital of the Province of Perugia, Italy, situated on picturesque hills between the Tiber and Lago Trasimeno, at an altitude of 1700 feet above the sea, 103 miles by rail southeast of Florence, and the same distance north of Rome (Map: Italy, G 4). Its situation is beautiful, offering delightful views of the Umbrian and Foligno valleys, and of the Tiber and the Apennines. Its mediæval appearance also is attractive and interesting. It has many striking edifices dating from its glorious days at the beginning of the Renaissance period, and numerous art treasures, but is not nearly so much frequented as Orvieto and Siena, with their famous cathedrals.

Perugia is irregularly laid out. Many of its substructures belong to the ancient Etruscan town. It possesses ample squares and pleasant grounds. The unfinished Gothic Cathedral of San Lorenzo is not very striking, although of the Renaissance period. The most valuable of its varied contents is Signorelli's "Madonna with John the Baptist." Its library possesses ancient and costly manuscripts. The Oratorio di San Bernadino has a multi-colored early Renaissance façade. The San Domenico is a fine Gothic church which has been attributed to Giovanni Pisano. It was rebuilt in 1614, and contains the elaborate and celebrated monument to Benedict XI. The Basilica San Pietro de' Cassinensi in the vicinity is also notable. It was constructed about 1000. It contains noteworthy pictures by Perugino, Caravaggio, and others, and has rich choir stalls in walnut. The notable old secular edifices of Perugia include the fine Collegio del Cambio, with its celebrated mural paintings of the Chief Virtues by Perugino —his finest fresco—and other artistic features, all in the best Renaissance. The immense Palazzo del Municipio, dating from 1281, is in Italian Gothic with two façades. It has been latterly restored, and is elaborately embellished with ancient sculptures, etc. Under its roof are the Vannucci picture gallery (municipal), a valuable collection of ancient Umbrian works taken from suppressed religious institutions, and the public library, with over 30,000 volumes and some rare mediæval manuscripts.

The finest section of the picture gallery is the Sala del Pinturicchio, with examples by Perugino and Pinturicchio. The College of San Severo is a notable ancient building, formerly a cloister. Here Raphael, who had been a pupil of Perugino, painted his first fresco in 1505. It is now in a spoiled condition. Among the attractive modern buildings are the arcaded Prefettura. In the centre of the modern city is a fine bronze equestrian statue of Victor Emmanuel II. Perugia has also a bronze statue of Julius III., a monument to Garibaldi, and a monument to the soldiers who fell for freedom in 1859. There are, besides, the beautiful Maggiore fountain, dating from the close of the thirteenth century and bearing reliefs by Nicola and Giovanni Pisano; the striking Roman Arch of Augustus, constructed in the third century of our era, and still one of the gateways of the city; and the house where Perugino dwelt.

The famous 'free' University of Perugia, founded in 1320, is now in a state of decline. It had, in 1901, two faculties, 26 teachers, and 320 students. Its library possesses 20,000 volumes. In addition there may be mentioned an Art History collection and a Botanic Garden, and the valuable university collection of Etruscan, Roman, and mediæval antiquities. There are in the city a lyceum, a gymnasium, a technical school, a seminary, an academy of fine arts, and an economic-agrarian institution. A large orphan asylum is the chief of its benevolent institutions. There are factories of silk goods, velvet, and spirits. In the commerce figure chiefly grain, wine, and oil. Three miles southeast of the city lies the Etruscan necropolis of Perugia, discovered in 1840, with remarkable tombs including the sepulchre of the Volumnii. Population in 1901, 61,385.

Perugia (anciently called *Perusia*) was one of the twelve important Etruscan League cities. It became Roman in B.C. 309. In B.C. 41-40 it was unsuccessfully held by the partisans of Antonius against Octavius (Perusian War). It was destroyed by Octavius and then rebuilt by him. It was again destroyed by Totila after a siege of seven years. Early in the Middle Ages it fell under the dominion of the popes, but it afterwards enjoyed a long period of independence, and at the close of the Middle Ages ruled Umbria. About the middle of the sixteenth century it was incorporated in the Papal States. It passed to the Sardinians in 1860 and became a part of the new Kingdom of Italy. Consult: Symonds and Gordon, *The Story of Perugia* (London, 1898); Cruickshank, *The Umbrian Towns* (ib., 1901).

PERUGIA, Lake of. A lake in Italy. See Trasimeno, Lago.

PERUGINO, pā-rōō-jē'nō, Pietro, properly Pietro Vannucci (1446-1523). An Italian painter, one of the chief masters of the Umbrian Schools during the earlier Renaissance. Born at Città della Pieve, a mountain town near Perugia, in 1446, Perugino was the natural heir of the traditions of the Umbrian School, the leading note of which was the atmosphere of sentiment and mystic poetry, which found its best expression in the portrayal of the ideals of devotional art. In 1455 he was apprenticed to a Perugian artist, probably Fiorenzo di Lorenzo, whose influence is manifest in his work. Benedetto Buonfiglio and Niccolò da Foligno have likewise been credited with his tutelage. According to Vasari, Perugino completed his studies under Verrocchio at Florence, but this seems unlikely in view of the severe tactile tendencies of Verrocchio's art and the unvarying Umbrian characteristics exhibited in Perugino's work. His first public commission was received in 1475 and related to the execution of certain frescoes for the Palazzo Communale in Perugia. From this time his rise was rapid, and when, in 1480, Sixtus IV. gathered together the best artistic talent in Tuscany and Umbria to embellish his newly completed chapel with fresco, although the company included such men as Rosselli, Ghirlandajo, and Botticelli, the major works were assigned to Perugino. The most important of these Sistine creations is the "Delivery of the Keys to St. Peter," a work showing great breadth of treatment, and peculiarly typical of his methods of bringing out the effects of space and atmosphere. The accurate knowledge of perspective, the feeling for the true values of distance, and the balancing and relation of these values make the work of Perugino peculiarly significant in view of the fact that these very elements of space composition were fundamental in the works of his pupil Raphael.

Perugino led a wandering life, but after 1502 he worked mostly in Florence, where he married and purchased a house, while retaining his citizenship in Perugia. In 1450 Perugino finished the decoration of the Sala del Cambio, Perugia, with frescoes allegorical of "Fortitude," "Temperance," "Justice," and "Prudence," and sacred subjects like "God, the Father," the "Nativity," and "Transfiguration." This work marks the height of his art. The "Marriage of the Virgin," now in the museum at Caen, belongs to this time. Painted for the cathedral at Perugia, it was the model of Raphael's production of the same subject. The most remarkable of Perugino's mural paintings, excepting those noted above, are the fresco of "Crucifixion," Santa Maria Maddalena, Florence (1492-1496), those at Città della Pieve, Panicale, Spello, and Trevi. Among the altar pieces may be selected "Virgin Enthroned" (1496), in the Vatican; the "Annunciation," Fano (1487); "Crucifixion," "Gethsemane," and "Assumption" (1500), from Vallombrosa, now in the Florence Academy; "The Vision of Saint Bernard," at Munich; the triptych painted for the Certosa, near Pavia, now in the National Gallery, London. His heads of "Two Monks of Vallombrosa" (Florence Academy) show him as a portraitist of high ability. His later pictures, of which he produced large numbers, show decline. The artist's last work, the "Nativity" (1522) from Fontignano, is now in the South Kensington Museum. He died of the plague at Castello di Fontignano in 1523.

Consult: Mezzanotte, *Della vita e delle opere di Pietro Vannucci* (Perugia, 1836); Jubinal, *Perugin, sa vie et ses œuvres* (Saint Germain, 1867); Braghirolli, *Notizie e documenti inediti intorno a Pietro Vannucci detto il Perugino* (Perugia, 1874); Caletti, *Lo stile di Perugino* (Bologna, 1887); Williamson, *Perugino* (London, 1900).

PERUVIAN ANTIQUITIES. The social structure of Peru was not unlike that of the more primitive tribes to the north. There was a head chief or Inca, who had an advisory council elected by the various clans or gentes of the people. The office of Inca was hereditary in the female line.

The religion was based upon the worship of the sun as the supreme god, who according to the Peruvians had three sons: Kon or Viracocha, Pachacamac, and Manco Capac, the last the founder of the Incan Empire. It is, however, probable that the myths of Viracocha and Pachacamac antedate the Incas. Legend says that Viracocha (q.v.) signifies Foam of the Lake or Sea. One day he arose out of the waters of Lake Titicaca and created the sun, moon, and stars. He made stone statues, and, putting life into them, commanded them to follow him to Cuzco. After setting Allca Vica, the ancestor of the Incas, over them he disappeared in the water.

Pachacamac signifies 'He who animates the universe.' He was regarded as the being who created and ruled the world. In the valley of Rimac a vast temple was erected to this invisible god.

Next to the sun the Incas worshiped the moon, his sister and consort. Cuycha, the rainbow, was venerated as the servant of the sun and moon; Chasca, the planet Venus, as the page of the sun. The Pleiades were the next most venerated. Fire was worshiped as coming from the sun, and thunder as his servant. After these were many minor deities and *canopas*, which last correspond to the Lares and Penates of the Romans. The bloody rites so frequent in Mexico and Yucatan were unknown in Peru.

The Peruvians believed in the existence of the soul after death, and also in the resurrection of the body. The good were to live a life of luxury and ease; the wicked must expiate their crimes by ages of wearisome labor.

The Empire of the Incas was a perfect theocracy. The reigning Inca was not merely the representative of divinity; he was divinity itself, the law, and the law-giver, the violation of whose ordinance was sacrilege. The Inca appointed the chief priest, who in turn nominated all his subordinates. All the higher offices were filled by members of the Inca family. The virgins of the sun were young maidens dedicated to the service of the deity. They dwelt in convents under the charge of elderly matrons. These holy virgins were occupied in weaving the fine wool of the vicuña into garments for the Inca and hangings for the temples. In the houses of the virgins of the sun at Cuzco all the inmates, said to number 1500, were of royal blood. These virgins of the sun were brides of the Inca, and at marriageable age the most beautiful were transferred to the royal seraglio. The great nobles were also allowed a plurality of wives. At an appointed day of each year all those of marriageable age were called together in the great squares, throughout the Empire. The marriage ceremony consisted in joining the hands of the couples to be united. The Inca performed this ceremony for his own kindred, pronouncing them man and wife. His *curacas* performed a like office for those of inferior rank. Land was allotted to the newly wedded pair for their maintenance, and a dwelling was built at the charge of the district.

The land was parceled out to the various clans by whom it was owned in common, and under the wise system of administration everyone not incapacitated by age or other infirmity was obliged to be a producer. Agriculture was the basis of prosperity and was carried on carefully and thoroughly, with division of labor, irrigation, manuring, and terracing of rocky slopes, to make every tillable acre yield its full return. Their chief crops were maize, potatoes, yucca, quinoa, and cotton. Much attention was given to irrigation, aqueducts and canals crossing the low lands in all directions like a vast network. Dogs were kept as elsewhere, besides monkeys, birds, and guinea pigs, and the llama had been domesticated as a beast of burden and for its hair, from which, as well as from native cotton, were spun and woven the fabrics in common use.

Peruvian architectural structures composed of stone were characterized by simplicity, symmetry, and solidity. These stones, often huge boulders, were put together without mortar, but so exactly cut and fitted to each other that the blade of a penknife could not be forced between them. The Peruvians excelled as road-builders. Remains of many of these roads exist, the most important ones extended from Quito to Cuzco, and, diverging, continued in a southerly direction. In places galleries were cut, for miles, through solid rock, rivers crossed by swinging bridges, and ravines filled up with solid masonry. It is estimated that some of these roads, which were used

[illegible] were from [illegible]

[illegible] of textile fabrics the Peru- [illegible] peoples. [illegible] the very style of weaving [illegible] of their tapestry, in the ex- [illegible] of the weaving and beauty of [illegible] and designs, has probably never been excelled. They showed a degree of skill in other [illegible] arts similiar to that displayed in their manufacture of cloth. They have left behind them many remarkable evidences of their knowledge in working metals. They were familiar with the processes of smelting, casting in molds, hammering, and soldering. Tools and various objects of bronze were in use. In the ancient tombs have been found many elegant and curious objects of gold and silver, vases, cups, bracelets, collars, and personal ornaments. Emeralds they possessed in considerable quantity and these they cut with great skill. In the manufacture of pottery they attained to a high degree of excellence. Many of these vessels are beautiful in outline. Often they represent the human form or that of some familiar object or animal, and in the firing and decoration they show an advanced stage in the potter's art.

In music they had reached considerable proficiency, judging by the number and variety of the musical instruments left behind them. Among these are Pan-pipes, flutes of cane and bone, clay trumpets, trumpets of shell, bells of bronze and copper, and a great variety of whistles, capable of yielding a scale of several tones. It does not appear that they ever reached the more advanced stage of stringed instruments. Of the character of their vocal music we know nothing.

They had considerable knowledge of medicine and surgery, employing bleeding and purging. In astronomy they had made some progress, dividing the year into twelve lunar months. They also had weeks, but of how many days is uncertain. As their lunar year would necessarily fall short of the true time, they corrected their calendar by solar observations made by means of columns raised on the high lands at Cuzco. These served them for taking azimuths, and by measuring their shadows they ascertained the exact times of the solstices. The period of the equinoxes was determined by the help of a solitary pillar.

The ancient Peruvians, having no written language, made use of the *Quipu*, a device consisting of a main cord with others of different colors depending from it like a fringe. Each color denoted some object or abstract idea. *Quipu* signifies a knot. Knots tied in the depending cords served as ciphers, and by tying them at different distances from the main cord and from each other, they could be made to represent numbers to any amount required. These knotted cords were also used as mnemonic aids. There was also a considerable body of song, legend, and drama handed down by oral tradition. Among these the drama of *Ollantay*, committed to writing soon after the Conquest, has been translated into several languages.

The burial customs varied in different parts of the country. Believing in the resurrection of the body, the same care was everywhere exercised to preserve it. The mummies, or more strictly speaking the desiccated bodies [illegible] owe their preservation to the exceedingly dry and rarefied atmosphere of the mountains or the dry nitrous sand of the coast regions. In preparing the body for the grave, it was commonly placed in a sitting posture, with the knees drawn up and the chin and hands resting upon them. In the extreme northwestern part of Peru the body was buried in an extended position. The mummies of the better class were often covered with wrappings of fine cotton cloth; over this were ponchos and blankets made of the wool of the alpaca and vicuña. With them were placed vases of elegant design, and often objects of gold and silver. The cerements of the poor are scanty and mean, and the objects buried with them of inferior quality. Food was always placed with the dead, and generally the objects most prized in life. The last resting place varied with the locality. In some places vast mounds, penetrated by galleries, were raised over the dead. In others mummies are found in little vaults or chambers of adobe, roofed with sticks or canes, often containing four or five bodies. In the Callao and parts of Bolivia the burials were in stone chulpas or burial towers.

Scattered over the country are extensive ruins of ancient temples, convents, palaces, and burial places, many of which undoubtedly long antedate the Incan Empire.

The ruins of the so-called temple, convent, and palace at Tiahuanaco, near the southern extremity of Lake Titicaca, in Bolivia, are good examples of pre-Incan remains. Although but few stones of the structures are in position, enough remain to show their character and size. In these buildings copper clamps were used to hold the stones in position. The temple was rectangular in form, 445 by 388 feet. Here also is the famous monolithic doorway. The stone is 13 feet 5 inches long, 7 feet 2 inches high, and 18 inches thick. Through this is cut the doorway, 4 feet 6 inches high and 2 feet 9 inches wide. Scattered about the ruins are blocks of sandstone, trachyte, and basalt, many of them symmetrically cut and elegantly decorated. When Tiahuanaco was first visited by Europeans these structures had been in ruins for such a length of time that even native traditions were silent as to their builders.

At Pachacamac (q.v.) the Incas erected a magnificent Temple of the Sun, a House of the Virgins of the Sun, and a temple to Pachacamac. The temple was rifled of a vast amount of gold and silver by the Spaniards.

On the islands of Titicaca and Coati, in Lake Titicaca, are a number of famous ruins. The island of Titicaca was dedicated to the sun, and was the sacred island of Peru. Its most notable ruins are those of the Palace of the Incas, the Storehouse of the Sun, and the Bath or Fountain of the Incas. The Temple, a stone building 51 by 44 feet, and two stories high, is in a fair state of preservation. The walls were covered inside and out with stucco, and painted, as may be seen by patches still remaining on the stones. The large stone edifice called the Store-house by the early chroniclers gained its title from the darkness of its small rooms and connecting passages, which precluded the idea that it had been used as a habitation. The Bath or Fountain has suffered but little from time. It is a pool 40 by 100 feet, and 5 feet deep, paved with worked stones and fed by four streams of water from openings cut in the stone.

On the island of Coati (dedicated to the moon) are two groups of ruins. The principal of these,

the Palace of the Virgins of the Sun, is in a fair state of preservation. It is rectangular in form, 183 feet long by 80 broad. The structure, built of roughly cut stones, was two stories high. The first story is divided into thirty-five apartments of various sizes. The floors of the upper rooms, which were probably of wood, have disappeared. The second group consists of stone buildings with narrow passages between them. These and similar buildings on Titicaca are believed to have been used for ceremonies through which pilgrims were obliged to pass before visiting the sacred shrines.

At Cuzco the Temple of the Sun was said to have been the most imposing edifice in all Peru. Existing remains confirm the accounts of the early chroniclers. Surrounding the Temple were other buildings, dedicated to the Moon, Venus, the Pleiades, the Thunder and Lightning, and the Rainbow.

Among the other notable ruins of Peru may be mentioned those of the ancient city of Chimu, consisting of a labyrinth of ruined walls, dwellings and other structures, and gigantic *huacas*, or burial places; Sillustani with its *chulpas* or stone burial towers and sun-circle; the great fortress in the valley of Cañete, near Lima; those of Hervai, in the valley of Huareu (also near Lima), including a temple said to have been dedicated to the oracle-deity, Rimac; the rock tombs of Ollantaytambo, these tombs being excavations, natural or artificial, in the face of a high cliff, within which the dead were placed and walled up with stones, stuccoed over and painted. Here also are the ancient porphyry quarries, and the remains of numerous Inca walls and structures.

Consult: Raimondi, *El Perú* (Lima, 1874-1902); Paz Soldan, *Diccionario geográfica-estadístico del Perú* (ib., 1879); Markham, *Cuzko and Lima* (London, 1858); id., trans., *Travels of Cieza de Leon* (ib., 1864); id., *Peru* (ib., 1881); Squier, *Observations on the Geography and Archæology of Peru* (New York, 1870); id., *Travels and Exploration in the Land of the Incas* (New York, 1877); Chérot, *Le Pérou* (Paris, 1876); Wiener, *Pérou et Bolivie* (ib., 1880); Bates, *Central and South America* (London, 1882); Middendorf, *Peru: Beobachtungen und Studien, etc.* (Berlin, 1893); Haëuke, *Descripción del Perú* (Lima, 1901); and the writings of Tschudi. For the history: Garcilaso de la Vega, *Royal Commentaries of Peru*, trans. by Markham (London, 1869); Prescott, *History of the Conquest of Peru* (Philadelphia, 1868); Markham, *The War Between Peru and Chili, 1879-81* (London, 1883); id., *A History of Peru* (ib., 1892).

PERUVIAN ARCHÆOLOGY. The Spanish Conquest came at the height of the power of the Incas in Peru. This people was of Quichua stock and they had conquered the tribes of the present country as well as those of Bolivia, Ecuador, and Chile, and had subjected them to their remarkable organization. The Incas, at their beginning a clan of the Aymara, had their ancestral seats on the shores of Titicaca, where they built a number of cities, the greatest of which was Tiahuanaco. Comparatively few in number, they moved north and settled in the valley of Huilcamayo. After taking Cuzco, the home of an earlier culture, they grew more powerful, and began their conquest about the year 1200. At first sun-worshipers, they later became sun-worshipers, and fixed this cult upon the people whom they subjugated. The success of the Incas was due to their despotic commune, by which they fixed the people to the soil, and in return for the regulated labor of all insured the well-being of each. The organization consisted of a priest-king, a council, hierarchy, rulers of districts, and grades of officials. The growth of Inca power occupied about three centuries, and since their history is somewhat well known they occupy a disproportionate station among the peoples of Peru. It is known that other civilizations preceded that of the Incas to which they merely superadded their peculiar organization.

There are three well-marked races in Peru, which are associated with three civilizations. Of these the Kechua or Quichua (q.v.) occupied the region from the river Andasmayo, above Quito, to the Rio Maure in Chile, except a narrow area extending from the basin of Lake Titicaca to the coast. They were an inland people, living in the high mountain valleys, the basin of Titicaca, the Collao, and on the eastern slopes of the Andes, above the forested zone, from which they were excluded by the wild tribes. The Aymara (q.v.), who preponderate among the existing Indians of Peru, are of Quichuan stock. A second civilization displaced by the Incas is that of the Quito Kingdom of Ecuador, which was the northernmost extent of the Inca dominion, and whose inhabitants were the Cara of early writers. A third civilization was that of the Muchik, called Yunga by the Incas and Chimu by the Spaniards, of which Pachacamac (q.v.) was an important city. The Chimu kingdom extended from the Gulf of Guayaquil south to Callao, the port of Lima; also south of this was the domain of another related people and civilization.

It seems probable that the oldest civilization in Peru existed in the Collao south of Lake Titicaca, where are found the rude stone circles and dolmens of Sillustani, which resemble the monuments of Northern Europe. (See MEGALITHIC MONUMENTS.) It is thought by some writers that the authors of the highland culture came from the south, settling in the Collao, hunting the huanaco and practicing rude agriculture, and spreading into the basin of Titicaca, which has a prominent place in Peruvian origin myths. Thence they spread throughout the mountain region, having domesticated the llama and occupying the lower valleys for the purpose of raising maize. In the highland region are found the numerous evidences of Quichua greatness: the stupendous and elaborate ruins of Tiahuanaco (q.v.) and Pumapungu; the tombs of Sipa in the Santa Valley, formed out of cubical blocks of stone; Huanaco, where is a temple of five stories of rooms and corridors close against a mountain wall, and built of great blocks of carefully dressed stone laid in mortar, and adorned with statues; the statues of Chavin, like those of San Augustin in Colombia; the remarkable square or round *chulpa* or burial towers, found about Umayo Lake, in the Collao, and in Bolivia.

Quichua architecture is expressed in massive stone furnished by the environment, and grades from the rude monolithic structures of the Collao to the finely constructed and finished Temple of the Sun at Cuzco, at the best period. In plan the buildings were rectangular, inclosing rooms, or with rooms surrounding a court. There were

fo[illegible] buildings, except the doors, so that t[illegible] a blank appearance, unrelieved [illegible]ture or ornament. The door jambs [illegible] and each other so that the threshold is [illegible] than the lintel. This feature is invariable in Inca architecture. The non-use of the arch and the lack of timber did not prevent the erection of buildings of more than one story. The pitched roofs were probably of cane, thatched with reeds and grass. The houses of the people were flimsy structures that have not survived. In many places rock masses have been modified in a remarkable manner, the most common form being the so-called seats, which are single or in tiers. No obstacles seem to have balked the highland Peruvians; with their bruising tools of stone they shaped granite hills, tunneling, cutting steps, platforms, fountains, or tombs as they saw fit; at this day it is difficult to see the purpose of many of their works. One of the most complicated of these sculptures, thought to be a hygrometric observatory, is found at Quenco, near Cuzco. On the same grand scale are the reservoirs, baths, fountains, and aqueducts; the terraced fields, called *andenes*, covering the mountain sides; bridges, roads, and road inns or *tambos;* fortresses, prisons; sun dials, rock tombs, and *chulpa* tombs, which prevail in the track of the ancient highland civilization. On the objects connected with daily life, rather than in architectural decoration, this people lavished the art of the metal-worker, potter, and weaver, producing many designs expressive of a luxuriant fancy, but rarely showing a sense of the beautiful.

The coast peoples, the principal of which were the Yungas, occupied the hot valleys near the Pacific. Their country extended from the Gulf of Guayaquil south to Callao, but south of this was another related people in the same culture plane. They had solved the problems of the arid region by dividing the channels of the rivers and by other irrigation works, some of which are in use to this day by Peruvian planters. Guano, brought from the islands, was used to fertilize their fields, a practice which the Incas adopted from them. They also had boats of reeds provided with sails, and made in them considerable voyages along the coast. The highland people had such boats on Lake Titicaca, and it is believed that they were derived from the coast tribes. The coast civilization was ancient, and had begun to fade away long before the Incas became prominent on the highland. The last political organization of the coast was the Chimu kingdom, whose capital was Chanchan, or Gran Chimu, near Trujillo, the ruins of whose principal buildings cover about 250 acres, but the remains of other works thickly cover a plain six by twelve miles in extent. This city, which may be taken as typical of the coast culture, was laid out in the form of a long parallelogram, extending inland from the sea. The material used for construction is adobe formed in large blocks; stone is used sparingly in minor details. This, it will be observed, is earthquake construction, the coast suffering from violent earth movements. The city was divided into squares by cross streets; large buildings of labyrinthine plan, with [illegible] and numerous rooms, the whole structure having a single entrance, occupied many of the squares; others were occupied by great palaces. Excavations have shown that the inclosed labyrinthine [illegible]ards were the quarters of the artificers [illegible] and were in effect fortresses, probably each assigned to a different trade. The walls of Chimu have broad foundations of stone, the superstructure of adobe bricks, the walls narrowing toward the top. Decoration was by frescoes, rustic work, or by laying the adobes in checker, lattice, or arabesque patterns. The roofs were of cane, and a few beams of algaroba wood have been found in the ceilings of chambers.

On the plain of Chimu may be seen the embankment of the aqueduct supplying the city with water, its terminals leading to the fields and into the city. Sunken gardens made by clearing away the soil down to the moist layer are numerous. The most prominent landmarks on the plain are the three pyramidal cemeteries. These are cellular structures built of adobe and stone. The largest covers an area 580 feet square, or eight acres, and is 150 feet high.

In material civilization the Peruvians stand first among the aborigines of this hemisphere, but in intellectual progress they fall below the Mexicans, especially in the lack of writing, of which the *quipus* of knotted cords of different color poorly took the place. They had some knowledge of astronomy and metrology; the balance, it appears, was used. Their surgical knowledge is shown by the successful trephining practiced.

Artificial deformation of the skull was extensively practiced. The people were of low stature (1600 cm., 5 feet 3 inches), thickset and strong, not differing in this respect from the present Peruvian Indians.

Consult: Tschudi, *Travels in Peru* (Eng. trans., New York, 1849); Salcamahuya, *An Account of the Antiquities of Peru* (London, 1873); Wiener, *Pérou et Bolivie* (Paris, 1874); Squier, *Peru* (ib., 1877); Reiss and Stübel, *Das Totenfeld von Ancon in Peru* (Berlin, 1880-1887); Brinton, *The American Race* (New York, 1891); Markham, *Cuzco* (London, 1856); id., *Narrative of the Rites and Laws of the Incas* (ib., 1873); id., *A History of Peru* (Chicago, 1892); Winsor, *Narrative and Critical History*, vols. i. and ii.; Stübel and Uhle, *Die Ruinenstätte von Tiahuanaco* (Breslau, 1893); McGee and Muniz, *Primitive Trephining in Peru* (16th Annual Report of the Bureau of American Ethnology, Washington, 1897); Nadaillac, *Prehistoric America*, Eng. trans. (New York, 1893); Baessler, *Ancient Peruvian Art* (ib., 1903).

PERUVIAN BARK. See CINCHONA.

PERUZZI, pā-rōōt'sē, BALDASSARE (1481-1536). An Italian architect and painter, the most gifted artist of the High Renaissance. He was born at Volterra, near Siena, March 7, 1481. Little is known of his early career, but from his work it is probable that he followed Il Sodoma and Pinturicchio in painting. In 1504 he went to Rome and speedily distinguished himself in frescoes in Sant' Onofrio—in the Vatican (ceiling of the Camera del Eliodoro)—and Santa Maria della Pace. Aided by Agostino Chigi, Baldassare studied the treasures of Rome, especially its architecture, and encouraged by Bramante, then in charge of the construction of Saint Peter's, became skilled in the elements of architectural design and composition. It is notable that in his detail especially he reflects the grace and sentiment of Umbria in his choice of profiles and ornament *motifs*, discarding the mechanized forms of Roman detail of the time of the Empire,

and choosing as his models the types used in the buildings of the Republic—forms which exhibit a delicacy of proportion and a pleasing individuality. In 1516 he designed for Agostino Chigi the Villa Farnesina, which was destined to become famous through the frescoes of Raphael and his school. The admirable frescoes on the ceiling of the room containing Raphael's Galathea are after his designs. In 1520 Leo X. appointed him, as the successor of Raphael, architect of Saint Peter's, and in 1525 he designed the Ossoli Palace, which shows an evident advance in the principles of planning. At the sack of Rome in 1527 Peruzzi was forced to paint a portrait of Bourbon, but upon its completion escaped to Siena, where he was made the city architect and superintended the construction of the Sienese fortifications. At this time he executed a number of frescoes and panel paintings, among which was the well-known "Augustus and the Sibyl" in the Church of Fontegiusta (Siena). His paintings are decorative in character, even to the sacrifice of truth to nature; they show the influence of Raphael and Michelangelo, and are apt to be mannered.

In 1532 he returned to Rome and commenced the building of the Massimi Palace, his architectural masterpiece, both in its general proportions and the variety of the detail and ornament. He carried on this work until his death in 1536, caused, according to tradition, by poison given by those envious of his position as architect of Saint Peter's.

Consult: Letarouilly, *Edifices de Rome moderne* (Paris, 1840-57); Donati, *Elogio di Baldassare Peruzzi* (Siena, 1879); Weese, *Baldassare Peruzzis Anteil an dem malerischen Schmucke der Villa Farnesina* (Leipzig, 1894).

PERUZZI, Ubaldino (1822-91). An Italian statesman, born in Florence. After pursuing the study of law at Siena, he went to Paris and Freiberg, where he devoted himself to the subjects of mathematics and mining. In 1848 he was appointed Gonfaloniere (chief magistrate) of Florence, but was removed in 1850 on account of his outspoken opposition to the reactionary policy of the Tuscan Government. He remained a warm advocate of liberal ideas and after the revolution of April, 1859, became a member of the provisional Government. After the annexation of Tuscany to the dominions of Victor Emmanuel, he was elected from Florence to the new Italian Parliament (1860). In 1861 he was Minister of Public Works under Cavour, and he continued in office under Ricasoli. Afterwards he held the post of Minister of the Interior in the Farini and Minghetti Cabinets. With Minghetti he went out of office in 1864, and thereafter acted as one of the Liberal leaders in Parliament.

PER'VIGIL'IUM VEN'ERIS (Lat., Night Watch of Venus). An anonymous poem of 93 lines, dating from the second or third century A.D., celebrating the power of Venus and referring to a nocturnal festival in her honor. It has been edited by Bücheler (Leipzig, 1859).

PESADO, pā-sä'dō, José Joaquin (c.1812-61). A Mexican poet and politician, born at San Augustin del Palmar. He was chiefly self-educated while living in Orizaba as a young man, became proficient in languages, science, and philosophy, entered politics in 1833 as member of the Vera Cruz Legislature, and five years afterwards was made Minister of the Interior. In 1854 he gave up his post as Foreign Minister, which he had held for eight years, to become professor of belles-lettres in the University of Mexico. He became joint editor of the paper *La Oposicion* in 1834, and wrote a novelette directed against the Inquisition, though religious subjects and Catholic sentiment prevail in his poems. Besides a collection of them, *Poesías originales y traducidas* (1839; 3d ed., 1886), he published a fragment, *La creacion* (1856), and a Spanish version of part of Tasso's *Gerusalemme liberata* (1860).

PESARO, pā'zä-rō. The capital of the Province of Pesaro e Urbino, Italy, situated at the mouth of the Foglia, on the Adriatic, and on the Bologna-Ancona Railroad, 29 miles northeast of Urbino (Map: Italy, G 4). It has broad streets, and is still partly surrounded by walls. Its fifteenth-century castle is now used as a prison. There are an old cathedral and a new cathedral, several palaces, including that of the dukes of Urbino, a public library of 35,000 volumes, a museum with collections of paintings and antiquities, a technical institute, and a musical lyceum, founded by Rossini, who was born here. The industries are silk-spinning, ship-building, and manufactures of ironware, earthenware, and machinery. There is a brisk shipping trade in figs, wine, oil, hides, grain, and cheese. Population (commune), in 1881, 20,909; in 1901, 25,103. Pesaro, the *Pisaurum* of the Romans, was founded in B.C. 184. It was destroyed by the Goths and restored by Belisarius and later formed a part of the Pentapolis. Pepin presented it to the Papacy. It came at the end of the thirteenth century under the rule of the Malatesta family, who sold it to the Sforza family in 1445. It was subsequently ruled by the Rovere dynasty of Urbino. In 1631 it reverted to the States of the Church, and since 1860 has formed a part of United Italy.

PESCADORES, pās'kä-dō'rās. A group of small basaltic islands situated off the western coast of the Japanese island of Formosa and on the Tropic of Cancer (Map: Japan, D 8). They cover an area of about 85 square miles and are mostly flat and barren. The largest of the group, Hokoto, has a good harbor. The inhabitants are engaged principally in fishing, and dried fish is the only export. Population, in 1898, 49,288, chiefly Chinese. The group was ceded to Japan, together with Formosa, in 1895, and is now an administrative dependency of Formosa.

PESCARA, pās-kä'rä, Fernando Francesco d'Avalos, Marquis of (c.1489-1525). A Neapolitan general in the Spanish service. He was taken prisoner by the French at the battle of Ravenna in 1512. During his captivity he composed poems addressed to his wife, Vittoria Colonna. Being soon after ransomed, he took part in several minor battles and contributed greatly to the victory over the French at Pavia in 1525, but was severely wounded. He commanded the army in Italy after the battle and was approached by Morone, the councilor of Francesco Sforza, Duke of Milan, in the interest of an Italian national party, since it was believed that Pescara was dissatisfied with Charles V. for not rewarding his services sufficiently. Pescara, however, betrayed the plot. He died soon after, November 30, 1525.

PESCHIERA, pās-kyā'rä. A fortified town in the Province of Verona, Italy, situated partly

on an island in the Mincio, and partly on the right bank of that river, on the Milan-Verona Railroad, 15 miles west of Verona (Map: Italy, I, 2). It was a member of the famous Quadrilateral (q.v.) until 1860. In the Middle Ages it was known as *Piscaria*, and belonged first to Verona and later to the Venetians, who strengthened its fortifications. Population (commune), in 1901, 2351.

PESCIA, pĕsh'ä. A town in the Province of Lucca, Italy, 29 miles west by north of Florence, on the Pistoia-Pisa Railroad (Map: Italy, E 4). It has a fourteenth-century cathedral, and an old castle, in which Galeazzo Visconti died in 1328. There are manufactures of silk, leather, paper, and hats, and a trade in wine, oil, and fruit. Population (commune), in 1881, 13,073; in 1901, 17,517.

PESELLINO, på'zĕl-lē'nō, or **PESELLO**, på-zĕl'lō, Francesco di Stefano (c.1422-57). An Italian painter, born in Florence. Little is known of his life, except that he was the grandson, and perhaps the pupil, of Giuliano d'Arrego. He first imitated Andrea del Castagno, and then Filippo Lippi. There is an "Adoration of the Magi" by him in the Uffizi Gallery, Florence, which shows his skill in painting animals. His other works include "The Trinity," in the National Gallery, London, and the predella (except the central panel, painted by Filippo) of the altar for Santa Croce, which is divided between the Accademia at Florence and the Louvre, Paris.

PESHAWAR, or **PESHAWUR**, pĕ-shä'wĕr. The capital of the newly formed northwest frontier province, British India, near the Kabul River, a tributary of the Indus 20 miles from the Afghan frontier, and 101½ miles east of the entrance to the Khyber Pass (q.v.) (Map: India, B 2). It is irregularly built with narrow winding streets, and is surrounded by a mud wall with watch towers. Although it dates from the fifth century, the city has few ancient monuments, and consists chiefly of mud houses. The cantonments contain a public garden, Christian churches, and a mission school. Peshawar is an important British military station, and is a great market; its bazaars are frequented by numerous Afghan and other Central Asiatic traders. It is the terminus of a railroad connecting it with the main railroad system of India. Population, in 1891, 84,191; in 1901, 95,147, of whom three-fourths are Mohammedans and 4000 Christians.

PESHIT'O, or **PESHIT'TO**. See Bible; section IV. *The Versions of the Bible—III. Aramaic.*

PESHWA, pĕsh'wä (Pers., leader). The Brahman ministers of the Mahratta dynasty of India. On the decline of the Mahratta rulers, the power of their ministers increased until in 1718 the first Peshwa, Balaji Visvanath, acting in the name of Maharaja Sahu, marched against Delhi to assist Farrukh Shah against the Mogul Emperor, Jehandar Shah. The Peshwa rule lasted for exactly a century. Balaji was succeeded in 1720 by his son, Baji Rao, who for twenty years was active in expeditions of conquest, even wresting Bassein from the Portuguese in 1739. He was followed in 1740 by his son Balaji Baji Rao, under whose administration the Mahrattas reached the acme of their greatness. They ravaged Northern India far and wide, levied *chauth*, or a quarter-tax, on Bengal, and were in formal possession of Orissa. In 1761, however, the last year of Balaji's life, the power of the Peshwas in Northern India was ended by their rout at Panipat by Ahmed Shah of Kabul, conqueror of the Punjab. Balaji was succeeded by his son, Madhu Rao, in 1761, who proved more than a match for Hyder Ali, and at the same time governed with remarkable order the Mahrattas themselves. In 1773, after the assassination of Narayan Rao, who ruled for a short time after Madhu's death, Raghunath Rao, a brother of Balaji Rao, became Peshwa. To defend himself against Narayan's posthumous son, Madhu Rao II., he was forced to call upon the English for aid. The first Mahratta War (1779-82) then broke out, in which Raghunath failed in his object, despite the aid of the English, and in 1782 he became a prisoner, while Madhu Rao succeeded him as Peshwa. Madhu committed suicide in 1795, after a puppet-reign, and was followed by Raghunath's son, Baji Rao II., the last of the Peshwas. To secure himself, Baji invoked English assistance, and by the Treaty of Bassein in 1802 ceded territory for the maintenance of the force given him. The result was an attack by the other Mahratta rulers, and the second Mahratta War (1803). This gave the Peshwa a prolongation of his rule, but he revolted in 1817. The third Mahratta War, which followed, ended in utter defeat for Baji and the extinction of the Peshwa power. His territory, which now forms the Bombay Presidency, was annexed by the English, and Baji Rao was a British pensioner until his death in 1853. His adopted son was the notorious Nana Sahib (q.v.). See Sindia.

PESNE, pän, Antoine (1683-1757). A French painter, born in Paris. He is said to have been a pupil of his uncle, Charles de la Fosse, and afterwards traveled in Italy. He lived most of his life in Berlin, where he was made Court painter to Frederick the Great, and director of the Academy. His portrait of the engraver Schmidt, in the Berlin Museum; his portrait of himself with his family (1718), in the New Palace, Potsdam; and the portrait of Vleughels, at Versailles, are familiar, vigorously painted pictures.

PESSIMISM (from Lat. *pessimus*, worst). The doctrine that life is or tends to become wholly undesirable, or that the world is essentially evil. It is thus contrasted with optimism, which teaches that the world is essentially good, and with meliorism, which maintains that the world is constantly becoming better and life more endurable.

Pessimism is characteristically a mental attitude toward life rather than a philosophical doctrine, and its significance is ethical rather than metaphysical. It never appears, however, except as a consequence of reflection and so of a certain amount of intellectual enlightenment. Most commonly it is the outgrowth of a consciousness of human impotence, and especially of the inadequacy of human effort in the struggle for ideal attainment. Where pessimism is based upon metaphysics, the world is usually conceived to be governed by blind necessity and human life to be a toy of fate. Accordingly the doctrine is most commonly maintained by those who hold a pantheistic conception of the universe, as the Orientals, or by those who conceive it as wholly determined by mechanical laws or as wholly

materialistic. Optimism, on the other hand, is a necessary corollary of belief in a beneficent God, and so is characteristic of theistic religions. (See LEIBNITZ for the argument.) At the same time there is a purely empirical pessimism—the denial that human life *per se* is worth while—which is compatible with any cosmological conception, whether theistic or not. Such a pessimism is that of the author of *Ecclesiastes*, and such a pessimism is the implied basis of Christian asceticism, by which physical life is valued only as a discipline for a more worthy existence.

Historically, philosophical pessimism has been of two leading types. Perhaps the most ancient is the pessimism of India, the essential character of which is the denial of the value of life on the ground that its pains overbalance its pleasures and progressively tend to do so with the growth of desire. This doctrine does not appear in the Vedic hymns; for these belonged to the restless, active period of the history of the Aryans in India, and activity is little compatible with pessimistic theory; but it early developed with Brahmanistic pantheism, and attained its full growth in Buddhism (q.v.). The salient features of Indian pessimism are: first, the assertion that life is predominantly painful; second, the notion that conscious evolution is dominated by growing desire and growing failure to attain satisfaction; and, third, the conception of Nirvana, or annihilation of individual consciousness as an ultimate relief from the fever of living.

In contrast to this Oriental pessimism stands the Greek type. This was faintly foreshadowed by the Platonic doctrine of the impotence of the material world in its efforts to attain the perfect good embodied in the divine ideas. Plato himself was saved from pessimism by the very vividness of his idealism; but with the philosophers who followed him the ethical problem became paramount and the problem of the existence of evil and the fact of human insufficiency were poignantly recognized. Epicurus (q.v.) is the typical Greek pessimist, his doctrine differing from the Oriental in that it denied the excellence of life in general and rather for its failure to achieve the good than for its mere painfulness. His practical doctrine, however—to make the best out of life by a temperate hedonism—speedily degenerated among his followers into a rough and ready sensuality. The most metaphysical and thorough-going of Greek pessimists was Proclus (q.v.), who taught that the whole evolution of the world is away from the divine or good.

But there was little congenial to pessimism in the exuberant paganism about the ancient Mediterranean; the classic peoples were too heartily in love with life. With the Teutonic Aryans the case was different. A gloomy fatalism was early characteristic of their myth and mood, and though the Northman looked forward to eventual annihilation in the cataclysmic contention of Ragnarok, the 'twilight of the gods,' rather than through passive absorption, his ultimate conception varied little from that of the Brahman. And the Teutonic point of view seems to have dominated mediæval Europe, giving it that ascetic pessimism which Christianity made empirical rather than ultimate. In modern times, however, pessimism has reasserted itself, largely under the influence of scientific determinism. The notion that the world is governed by invariable laws and conserves none but material elements has seemed to argue the defeat of the commonest human expectations. The pessimistic reaction has appeared most strongly in poets, as occasionally in Tennyson, for example, but notably in the Italian Leopardi (q.v.) and in James Thomson, the author of *The City of Dreadful Night*. In philosophy Schopenhauer and Hartmann (qq.v.) are the chief exponents of modern pessimism. The pessimism of the former is the result of his philosophic creed and is curiously eclectic in its origin. Schopenhauer as a follower of Kant believed that the world is a creation of experience to be idealistically interpreted; but according to his interpretation the creating power is a blind, uneasy, hapless-tending will, while intelligence is a suffering consequence of the will's activity. The painfulness of conscious life he endeavored to establish upon empirical, psychological grounds, and this feature of his pessimism is plainly Oriental in source. His further doctrine, however—that final escape from the misery of existence is to be attained through pure intelligence defeating the blind energy of the will by overcoming desire—seems to be allied not only to Brahmanism, but also to the Platonic doctrine of escape to the world of divine ideas and the Spinozistic theory of immortality through the soul's identification with eternal verities. (See PLATO; SPINOZA.) Schopenhauer's disciple, Hartmann, carried the doctrine further by arguing that the evolution of consciousness from an unconscious universe must ultimately result in an intelligence so acutely powerful that it should not only put an end to individual consciousness and desire, but compel the whole world's suicide.

It is but fair to state that pessimism is not necessarily a result of deterministic metaphysics, nor yet of pantheism. Herbert Spencer's meliorism teaches that the world is compelled to evolve desirable existence, and, indeed, that its essential activity is one of betterment; while Nietzsche, originally a disciple of Schopenhauer, finds optimistic inspiration in the Darwinian struggle for existence with its promise of the evolution of finer types of being; the necessity for pain he recognizes, but counts it of small import in comparison.

Consult: Sully, *Pessimism: A History and a Criticism* (London, 1877); Schopenhauer, *The World as Will and Idea* (Eng. trans., ib., 1883-86); Von Hartmann, *The Philosophy of the Unconscious* (Eng. trans., ib., 1884); Saltus, *The Anatomy of Negation* (ib., 1886).

PESTALOZZI, pĕs'tä-lōt'sē, JOHANN HEINRICH (1746-1827). A Swiss educational reformer, and the chief founder of modern pedagogy, born at Zurich, January 12, 1746. As a student in the University of Zurich he allied himself with the young reformers of whom Lavater was the leader, and in a contribution to the *Memorial*, the organ of that faction, he expressed a wish that intelligible principles of education might be disseminated among his countrymen. He studied theology, then law, then, under the influence of the current naturalistic philosophy, and particularly Rousseau, turned to agriculture, with the avowed purpose of improving the condition of his countrymen by setting for them a good example in scientific agriculture, and, finally, when past middle life, began work as a teacher. He undertook to put in constructive form the ideas cast

by Rousseau in a destructive and critical form. It it was who tested the value of 'education according to nature.' Pestalozzi himself was unpractical and a bad organizer and manager, yet through his writings he aroused the Germanic peoples to the importance of social reform through education, and through his personal efforts he inspired a number of disciples who developed and carried out the principles of his practice until they became the basis of the educational movement of the nineteenth century. In 1767 he bought a hundred acres of poor land and erected a house thereon, naming the place Neuhof. Here he brought, two years later, his bride, and here for seven years he sought to demonstrate Rousseau's ideal life in a return to Nature. Though the experiment was a failure, yet in his attempt to educate his one child after the manner of the *Emile* he discovered the deficiencies of Rousseau's teachings, and later rejected the extravagances, and accepted the essential truths of the teachings of his master. Here also he wrote a 'Father's Journal,' which laid the basis of modern child study as an approach to the solution of educational problems. Undaunted by poverty and failure, and moved by the wretched state of the children of the poor, in 1775 he turned the farm into an asylum, where he housed, boarded, and clothed the children, in return for such work as they could give, thus hoping to regenerate his people by striking at the root of the evil through the industrial education of the young. The failure of this enterprise in 1780, due in a measure to the unsympathetic attitude of the parents of his wards, revealed to him the doubtful nature of the principle upon which it had been based, namely, that the reform of the individual and of the race could come through an improvement of the environment. Then followed a period of eighteen years of financial distress, and a corresponding period of great literary activity. During this time he gave up all practical efforts and devoted his energies to thinking out social and educational problems. The solution reached was that individual and social reform can come only through the moral and intellectual improvement of the individual by means of educational effort. In his *Abendstunde eines Einsiedlers* (published 1780) and his *Lienhardt und Gertrud*, the first volume of which was issued in 1781, he first presented this doctrine. The latter work, soon expanded into several volumes, was a novel descriptive of peasant life, which had an enormous popularity, since it fell in with the idealistic and revolutionary tendencies of the times.

The fundamental ideas of *Lienhardt und Gertrud* were that the condition of the people was to be bettered by education, not by revolution; that education was to centre in the home, and not in a separate institution; that this education was to begin at the cradle, and that the first few years were of the greatest importance; that an ignorant mother, by following the method given in his book, could educate her children as well as a teacher in possession of all science; that if homes were thus reformed, misery would disappear, and society would be revolutionized. From 1787 to 1797 Pestalozzi was again engaged in agricultural experiments. During this period he formed the acquaintance of Fellenberg and Fichte, and in 1792 was proclaimed French citizen with Klopstock and Washington. After the long period of literary work, during which Pestalozzi wrote 20 volumes, the exigencies of war forced him again into active life, and in 1798 he became director of an orphan asylum at Stanz, where he attempted to work out the ideas of *Leonard and Gertrude* (as the work is known in English), of combining learning with hand work, and centring it upon the objects of the child's immediate environment. It was along this line that Pestalozzi thereafter worked, and had his permanent influence. In 1799 he entered upon active schoolroom work at Burgdorf, and later at several other places. In 1802 Pestalozzi went to Paris as a member of the consulta summoned by Bonaparte to settle the fate of Switzerland, and while there memorialized the First Consul upon the educational needs of his country, but received the curt reply that there was no time to bother about A B C matters. He established the Institute at Yverdun in 1805, from which emanated the influence that was to give inspiration to all modern education. Here gathered not only the children of the schools, but great numbers of teachers from most of the leading States in Europe in a sort of normal school; here were sent by the Prussian Government the teachers that were to assist in introducing his ideas into the German Volksschulen. Even here his work as a practical teacher was unsuccessful, and in 1825 he was forced to withdraw as a broken-down and disappointed old man. He died at Brugg, February 17, 1827.

Pestalozzi never systematized his ideas or his method. In 1801 he published *Wie Gertrud ihre Kinder lehrt*, which purports to give a summary of his work, but it contains no definite formulation of either principle or method. His great effort, on the purely educational side, was, to use his own expression, to 'psychologize education.' To this effort is due the great attention that has been given to the study of method, both practical and theoretical, from that day to this. In Pestalozzi's passionate love, however, for his people, and particularly for children, and his readiness to sacrifice all personal interests for them, lies the secret of his powerful influence. This trait in his personality is what made him honored and loved by his contemporaries. The inspiration he affords to the struggling pedagogues is not the least of the benefits he conferred upon posterity.

Bibliography. In addition to many editions of single works, there is a complete edition in 18 volumes by Seyffarth (Berlin, 1881); *Lienhardt und Gertrud* has numerous translations or abridgments, as also *Wie Gertrud ihre Kinder lehrt*. Consult: De Guimps, *Pestalozzi, His Life and Works* (New York, 1889); Barnard, *Pestalozzi and Pestalozzianism* (ib., 1862); Krüsi, *Pestalozzi, His Life and Works* (ib., 1875); Pinloche, *Pestalozzi* (ib., 1901).

PESTALOZZIAN MOVEMENT. A term sometimes applied to the modern tendency to base schoolroom instruction on psychologic principles. It dates from the days of Pestalozzi (q.v.). This movement began in Germany in the early part of the nineteenth century and was initiated in the United States by Horace Mann (q.v.). See Pedagogy; Education; Pestalozzi.

PESTH, pēst. A city of Hungary, now united with Buda to form Budapest (q.v.).

PESTILENCE (OF., Fr. *pestilence*, from Lat. *pestilentia*, plague, from *pestilens*, infected, from *pestis*, pest). The terms plague and pestilence have until recent times been used indiscriminately to denote any diseases of an epidemic character which affected large masses of the community, and were remarkable for their fatality, such as the Oriental plague, the sweating sickness, cholera, certain virulent forms of fever, etc. The term *loimos* was applied by the Greeks to a species of epidemic remittent fever; and the plague of Athens described by Thucydides is manifestly an epidemic form of the same disease, which is endemic in the summer season on the coasts and islands of the Mediterranean and particularly the Archipelago. We find in the early history of the colonization of the West Indian islands and the United States frequent examples of the term plague being applied to the remittent fever of these regions, and especially to epidemic attacks of yellow fever. During the Middle Ages the term *pestis* was applied to numerous disorders, such as syphilis, smallpox, erysipelas, epidemic sore throat, petechial fever, the sweating sickness, gangrenous pneumonia, ergotism, etc. The Black Death of the fourteenth, fifteenth, and sixteenth centuries was the bubonic plague; and the Great Plagues in China in the fourteenth century were probably also bubonic.

Several Hebrew words are translated *pestilence* or *plague* in the Old Testament. Some of these pestilences are beyond the reach of inquiry; others have the characteristics of modern epidemics. See BLACK DEATH; PLAGUE.

PETAL (from Gk. πέταλον, *petalon*, leaf, neu. sg. of πέταλος, *petalos*, outspread). One of the individual parts of the corolla (q.v.). See FLOWER.

PET'ALESHA'RO. A Pawnee chief of the Skidi band who distinguished himself by an act of humane bravery in rescuing a captive girl who was about to be sacrificed by his tribe. The captive, a girl taken from the Sioux tribe, was being led to the scaffold when Petalesharo, who as yet was only a young warrior, broke through the circle, seized the girl, and, throwing her upon one of two horses which he had in waiting, was off with her before the people could recover from their surprise. Distancing pursuers, he escorted her to a place of safety near her own country, and then left her to find her way home on the horse which he gave her. On returning to his village he faced the anger of the tribe with such boldness that he was allowed to go unharmed, and was ultimately able to break up the practice of human sacrifice by procuring the substitution of a vicarious ceremony. On subsequently visiting Washington as a delegate from the Pawnee in 1821 he was presented with a medal by the ladies of the city in recognition of his services to humanity. See PAWNEE.

PETARD (OF. *petard*, *petart*, Fr. *pétard*). A device for demolishing the defenses of an enemy, creating a breach through which the besiegers may force an entry. Under modern conditions it has become obsolete. It consisted of a half cone of thick iron filled with powder and ball, and fastened to a plank which was provided with hooks, by which it could be attached to a gate or wall. The engineers attached the petard, lighted the slow-burning match by which it was to be fired, and retired. When the explosion took effect a supporting column charged through the breach, and took advantage of the confusion within. A petard would sometimes contain fifteen pounds of powder.

PETA'VIUS, DIONYSIUS, or DENIS PÉTAU (1583-1652). A French theologian and philologist, born at Orleans. His father, a man of learning, encouraged his studies, and he took up mathematics and belles-lettres, also philosophy, which he pursued both at Orleans and Paris. During his student years at Paris he formed a warm friendship with Isaac Casaubon (q.v.), whom King Henry IV. had invited to Paris in 1600. In 1602 he accepted the chair of philosophy in the University of Bourges, but resigned in 1605 and entered the Jesuit Order at Nancy. He studied theology for two years at the College of Pont-à-Mousson, and in 1621 became professor of *theologia positiva* at the University of Paris, and held the post for twenty-two years. He is regarded as one of the greatest scholars the Jesuit Order has possessed. In philology his works include annotated editions of Synesius (1611), Themistius (1613), Julian (1614), Nicephorus (*Breviarium Historicum*, 1616), and Epiphanius (*Opera Omnia*, 1622). In his *Opus de Doctrina Temporum* (Paris, 1627) he presented a new system of chronology, further developed in *Uranologion* (1630). A history of the world, *Rationarium Temporum* (1633), from the earliest times down to 1632, has been reprinted as late as 1849. His great work, a history of doctrines, *Opus de Theologicis Dogmatibus*, 5 vols. (1644-50), was left unfinished. Consult his *Life* by Stanonik (Gratz, 1876).

PETCHARY, pĕch'ā-rĭ (West Indian name, onomatopoetic in origin). An old book name for the large tyrant flycatchers of the West Indies, known elsewhere as kingbirds. The term has survived, however, in Jamaica for the gray kingbird (*Tyrannus Dominicensis*), and especially for *Tyrannus caudifasciatus*, one of the most common birds of the West Indies, often shot in the fall as a table delicacy. See KINGBIRD.

PETCHORA, pā-chō'rā. A river of Northern Russia. It rises on the western slopes of the Ural Mountains, in the Government of Perm, and flows northward through the Government of Vologda and a part of Archangel; then it turns to the southwest and finally resumes its original course at the mouth of its tributary the Tzilma, and enters the Arctic Ocean through an extensive delta, containing numerous islets (Map: Russia, H 1). Its entire length is estimated at from 1000 to 1300 miles, of which about two-thirds is navigable. The chief tributaries are the Koshva, Ishma, Ussa, and Tzilma. The region through which the river flows is known as the Petchora or Arctic steppes, and is very sparsely populated. The Petchora is of considerable importance as a navigable waterway, being used for the transportation of the products of the north—fur, fish, etc.—into the interior, from which grain and other necessaries of life are sent in return into the northern districts.

PETECHIA, pē-tēk'ĭ-ā (Neo-Lat., from It. *petechia*, spot, scab, from Lat. *petigo*, scab, or from Lat. *pittacium*, from Gk. πιττάκιον, *pittakion*, label, plaster). A name given to a spot of a dusky crimson or purple color, quite flat, with a well-defined margin, and unaffected by pressure, which closely resembles flea-bites.

Petechiæ result from a minute extravasation of blood beneath the cuticle. They may occur on any part of the skin or mucous membranes, and when large are called ecchymoses. They indicate an altered state of the blood, and are often symptoms of very serious diseases, as of typhus fever, plague, scurvy, etc. They likewise occur in very severe cases of smallpox, measles, and scarlet fever, when their presence must be regarded as indicative of extreme danger. Cerebro-spinal fever is sometimes called 'petechial fever,' from the small hemorrhagic spots which cover the body in certain cases.

PETER (Lat. *Petrus*, from Gk. πέτρος, Peter, πέτρος, rock), or SIMON PETER. The Apostle of Jesus who is named first in each of the lists of the Twelve in the Synoptic Gospels. His original name was the Hebrew *Shim'ôn*, which was easily shortened to conform to the Greek Simon. He was the son of a certain Jona and (cf. John i. 44) was a native of Bethsaida. In his early manhood he was a citizen of Capernaum. Here he had a house, and with his brother Andrew was engaged in the fishing business in partnership with Zebedee and his sons (Mark i. 16-31, and parallels). He was married, but whether he had any children is not known. It is likely that he was a man of some property, not a poor, grossly ignorant laborer, though he was not rich. Of his early education and attainments we know nothing. Galilee, his home, was practically a bilingual country, with a fair degree of Greek culture possessed by the Gentile elements of the population. Hence Peter had opportunity for becoming acquainted with colloquial Greek, and there is no good reason for supposing that he was unable to use his Greek Old Testament intelligently.

When the news of the preaching of John the Baptist reached Galilee Peter and Andrew went to hear him. They were impressed and attached themselves to him as at least temporary disciples. Here they became acquainted with Jesus, who gave to Simon the surname Cephas, i.e. *rock*, or, in Greek, Peter (John i. 35-42). After continuing with Jesus a while the brothers returned to their accustomed occupation. Soon after He opened His public ministry in Galilee Jesus summoned them from their nets to a permanent discipleship (Mark i. 16, and parallels). They at once left all and followed Him. Into the details of Peter's experiences during his two years' intimate association with Jesus we cannot enter. The many incidents recorded in the Gospels give a fairly adequate idea of his general character and disposition. He was a whole-hearted though often blundering disciple. His willingness to be taught enabled him finally to grasp certain great essentials of Jesus' character and mission, so that Jesus could say that he was the 'rock' on which he would build His Church (Matt. xvi. 18). He was one of the three disciples with whom Jesus was most intimate, who alone witnessed His transfiguration (Mark ix. 2-10) and agony in Gethsemane (Mark xiv. 33). Thoroughly convinced of Jesus' Messiahship, even when the tide of popular favor had begun to ebb, he was yet in great need of enlightenment as to what it really signified (Mark viii. 29-33). His impulsive nature led him to deny his discipleship when Jesus was on trial, but his deeper and more permanent love for his Master soon reasserted itself, and he returned to the scene and was an eyewitness of the Passion (cf. I. Peter v. 1, and the article PETER, EPISTLES OF). He was the first of the Apostles to whom Jesus revealed Himself after His resurrection (I Cor. xv. 5; cf. Luke xxiv. 34), was present at most of the post-resurrection interviews between Jesus and the disciples, and to him in particular Jesus tenderly and suggestively reintrusted his apostolic commission, at the same time intimating the self-denial and suffering that awaited him in his future career (John xxi. 15 sqq.).

After the departure of Jesus Peter was easily recognized as one of the leading spirits of the little company of believers who were hoping for something, just what they did not know, and who formed the nucleus of the Church. It was he who suggested the appointment of Matthias to take the place of Judas Iscariot, and a few days later, on the day of Pentecost, made the first public attempt to explain and set forth the claims of Christianity and urge its acceptance upon his fellow Jews (Acts i. and ii). During the next few years, when the first converts were being secured and the first steps in organization planned, Peter seems to have been the most influential man in the Church. His fellow worker and most intimate friend was John. When Christianity spread beyond the bounds of Jerusalem into the various districts of Palestine, Peter and John, and afterwards Peter alone, rendered efficient aid by visiting and further instructing the new converts. In Samaria, on such a visit, he came in contact with the local magician Simon Magus (q.v.), a professed convert, whose ignorant cupidity he sternly rebuked (Acts viii. 20). Another such tour led him as far as Joppa, on the coast, whence, by divine guidance, but against his prejudices, he went to Cæsarea to proclaim Christianity to Cornelius, the Gentile centurion. He received him and his house in Christian fellowship, and set aside his prejudices so far as to sit at table with them, something he had never before done (Acts x.). For such conduct an explanation was demanded by some in the mother church. Though it was pronounced satisfactory, it is probable that certain ultra-conservatives did not approve of what had been done (Acts xi.).

Up to the attempt of Herod Agrippa I. to put him out of the way, i.e. near 44 A.D., or for about 15 years (cf. Acts xii. 3 sqq.), it is probable that Peter made his headquarters in Jerusalem. He was the one member of the Apostolic band whom Paul, three years after his conversion (37 or 38 A.D.), went to Jerusalem to consult (cf. Gal. i. 18). Paul was with Peter 15 days, and in that time was doubtless given a full account of the earthly career of Jesus as complete as Peter's memory allowed. This notice from Paul's own letter is weighty evidence as to Peter's influential position in primitive Christian circles.

After his escape from Herod he left Jerusalem. We know nothing more of him until the time of the Council of Jerusalem (49 A.D.). Here he urged a liberal attitude toward Gentile Christians. With James and John he gave Paul and Barnabas the right hand of fellowship. Soon after this he seems to have visited Antioch (Gal. ii. 11 sqq.), and, true to his principles, fellowshiped heartily with the Gentile members of the Church there, making no distinction between them and himself. But when overzealous emissaries from James of Jerusalem came to Antioch

and insisted that the two classes should not eat together Peter vacillated, and weakly submitted to their dictation. This brought forth a sharp and well-deserved public rebuke from Paul (Gal. ii. 14 sqq.). There is no reason to suppose that this resulted in any lasting personal animosity betwen the two. Of Peter's further career we possess almost no information. It is probable that he was occupied in missionary labors, mainly among Jewish communities, in accordance with the agreement noted in Gal. ii. 9. On his journeys he was accompanied by his wife (I. Cor. ix. 5). If the word 'Babylon' (I. Peter v. 13) is to be taken literally, he must have labored mainly in Eastern Syria and the Tigris-Euphrates Valley. But 'Babylon' may be only another name for Rome. In I. Cor. i. 12 (written about 55 A.D.) reference is made to a 'Cephas' party in the Corinthian Church. But this does not imply necessarily that Peter had personally visited Corinth. On the other hand, the absence of any reference to him in Paul's letter to the Roman Church (of about the same date) does not make it certain that Peter had not been or was not then or soon after in Rome. The Apostles did not promptly inform each other of their respective movements. The view that Peter wrote I. Peter at Rome about 54 A.D. to Jewish and other Christian communities of Asia Minor has no decisive evidence against it, and of the corresponding view that II. Peter was likewise sent from the same city, but at least ten years later and to a different circle, the same may be said. The whole matter of Peter's presence in Rome at any time rests, it must be admitted, on a very insecure foundation. There is no positive evidence to that effect in the New Testament, and the earliest notice of Peter in early Christian literature (I. Clement v.) is equally indecisive. The next earliest notice (Ignatius, *Ep. ad Rom.*, IV. 3), about 110 A.D., is almost as vague. Later writers (Justin Martyr is a notable exception) generally represent Peter as having labored long and suffered martyrdom in Rome. While obviously unhistorical legends, such as those relating to his controversy with Simon Magus, have grown up in order to fill out a complete story, his residence in Rome for a longer or shorter period is usually accepted, not only by Roman Catholics, but by Protestant scholars of high rank. That he was martyred under Nero about the year 64 is probable, though not certain. Tradition relates that he met his death by crucifixion, but at his own request with his head downward, counting himself unworthy to suffer exactly in the same way as his Master. Roman Catholics reckon St. Peter as the first Bishop of Rome and the first Pope. Consult the works referred to under PETER, EPISTLES OF, especially the extensive bibliography by Chase in the Hastings Dictionary of the Bible; also Lightfoot, "Saint Paul and the Three," in his *Commentary on Galatians* (London, 1865); id., *The Apostolic Fathers*, Part I., Clement of Rome (ib., 1890); Lipsius, *Die apokryphen Apostelgeschichten* (Brunswick, 1887); Schmid, *Petrus in Rom* (Lucerne, 1892); Felten, *Die Apostelgeschichte* (Freiburg, 1892); Fouard, *Saint Peter* (London, 1892).

PETER I., ALEXEYEVITCH (1672-1725). Emperor of Russia from 1682 to 1725, generally known as Peter the Great. He was the son of the Czar Alexei Mikhailovitch by his second wife, Natalia Naryshkin, and was born at Moscow, June 9 (May 30), 1672. Peter's half-brother Feodor, who succeeded his father in 1676, died without issue in 1682, having named Peter as his successor, to the exclusion of his own full brother, Ivan, a feeble-minded prince. The Grand Duchess Sophia, Peter's half sister, attempted to set aside this arrangement and to obtain control of affairs. To this end she brought about an insurrection of the Streltsi (q.v.), and after much bloodshed Ivan and Peter were crowned as joint rulers and Sophia became Regent (July, 1682). Peter's education was not carefully looked after, and at an early age he gave evidence of those stormy passions which were to characterize his entire life. In February, 1689, Peter married Eudoxia Feodorovna Lapukhin, and soon after he called upon his sister to resign the government. This she would not do without a contest, and Peter was forced to flee from the capital, but the foreigners in the Russian service, led by Lefort and the Scotchman Gordon (q.v.), joined his party, and when the Streltsi deserted her the Regent yielded and was shut up in a convent. On October 11, 1689, Peter made his public entry into Moscow, where he was met by Ivan, to whom he gave a nominal precedence, reserving the sole exercise of power for himself. Ivan died in 1696. Peter was the first of Russian sovereigns to grasp the value and significance of Western civilization. He at once began the slow task of forming out of the barbarous and undisciplined material available an army on the European model. His ambitions were chiefly directed, however, toward creating a navy and developing the commerce of his country. Russia had no practicable seaboard, being shut out from the Baltic by Sweden, which possessed Finland, Ingermanland, Esthonia, and Livonia, and from the Black Sea by Turkey; leaving only the White Sea and the Arctic Ocean, with the solitary port of Archangel, available for a Russian navy. Peter therefore set on foot what has become the established Russian policy, of seeking in every direction an outlet into ice-free seas. The Black Sea seemed to him to be the most available for a first move. He launched Russia upon her career of warfare against the Turks, and succeeded in making himself master of the city of Azov, at the month of the Don, in 1696. Peter brought in engineers, naval architects, and ordnance experts from Austria, Venice, Prussia, and Holland; built ships; improved the equipment and discipline of the army; and sent many of the young nobility to study in foreign countries. After repressing a revolt of the Streltsi in February, 1697, Peter put the administration into the hands of a council and left Russia in April, traveling as a subordinate member of an embassy, headed by Lefort, for the purpose of acquiring at first hand the knowledge necessary to develop his Empire. He thus visited the Baltic provinces, Prussia, and Hanover, and subsequently Holland, where at Amsterdam and Saardam he worked as a common shipwright. On the invitation of William III., King of England, he visited that country, remaining for three months. He left England in April, 1698, taking with him about 500 English engineers, surgeons, and artisans, and visited Vienna for the purpose of inspecting the Austrian army. His travels were cut short by a second revolt of the Streltsi, which necessitated his return to Russia in Sep-

[illegible] 1698. General Gordon had crushed the [illegible] but Peter determined to be finally rid of [illegible] turbulent soldiery, and the organization was [illegible] up and its members executed in large [illegible] bers. Peter divorced the Czarina Eudoxia, [illegible] with his sister Martha was suspected of [illegible] complicity in the outbreak, which had been fostered by the Old Russian Party. The process of introducing Western civilization continued. Printing and education were promoted, the calendar was partially reformed, and Western methods of enumeration were introduced. Systematic taxation of commodities was adopted as a source of revenue; foreign commerce was encouraged; and much of the Orientalism in dress, manners, and customs which had grown up during the Mongol supremacy gave place to the ways of the Occident. The Church was reorganized, its government being intrusted to the Holy Synod, of which the Czar was the head.

Having secured to Russia access to the sea on the south, Peter turned his eyes toward the Baltic, the possession of whose shores he determined to dispute with Sweden. That kingdom since the time of Gustavus Adolphus had been the strongest military power in Northern Europe. In 1700 Peter made an alliance with Sweden's enemies, Denmark and Poland, and threw down the gauntlet in the struggle for the Baltic supremacy. He was badly defeated by Charles XII. at Narva, where his raw troops, although vastly superior in numbers, were wholly unable to cope with the Swedish veterans (November 30, 1700). Peter was not disheartened. Taking advantage of the Swedes being employed elsewhere, he seized a portion of Ingermanland, in which he laid the foundation of the new capital, Saint Petersburg (1703). Great inducements were held out to those who would reside in it, and in a few years it became Russia's commercial depot for the Baltic. For a long time in the contest with Sweden the Russians met with defeat, but Peter saw that reverses were administering to his troops a wholesome discipline. In 1709 Charles XII. rashly invaded South Russia, and on July 8th his army was annihilated by the Czar at Poltava. This event marked the collapse of the Swedish power. In the following year Peter was master of Livonia. He now found himself at war with the Turks, whom Charles XII., who had taken refuge among them, had stirred up to hostilities. In 1711 Peter was caught in a trap on the Pruth and was forced to conclude the Treaty of Hush (July 23d), by which he gave up the port of Azov and the territory belonging to it. On March 2, 1712, Peter's marriage with his mistress, Catharine (see CATHARINE I.), was celebrated at Saint Petersburg, and two months afterwards the central Government was transferred to the new capital. The war against Sweden was prosecuted with energy and success. In 1713 the Swedish general Stenbock was forced by the Danes, Saxons, and Russians to surrender at Tönning, in Schleswig. About the same time the Russians made themselves masters of Finland, and in 1714 the Russian fleet overwhelmed the Swedes near the Åland Islands. In 1716 and 1717 Peter made another tour of Europe. In 1718 a widespread conspiracy looking toward the undoing of Peter's reforms was discovered and among those implicated was the Crown Prince Alexei Petrovitch (q.v.). Peter caused his son to be sentenced to death, but pardoned him later. The unfortunate prince, according to the most probable accounts, died in prison from the effects of the torture to which he had been subjected. In 1721 peace was made with Sweden, which surrendered to Russia Livonia, Esthonia, Ingermanland, Karelia, and a small portion of Finland, together with all the islands along the Baltic coast from Courland to Viborg. In the same year Peter assumed the title of Emperor of All the Russias. In 1722 Peter commenced a war with Persia in order to open the Caspian Sea to Russian commerce. Derbend and Baku were the fruits of this war. The last years of Peter's life were chiefly occupied in beautifying and improving his new capital, and carrying out plans for the diffusion of knowledge among his subjects. In the autumn of 1724 he was seized with a serious illness, the result of his imprudence and habitual excesses; and after enduring much agony, he died, February 8 (January 28), 1725.

Upon the political life of Russia Peter the Great left a powerful impress, and though many of his social reforms proved in the end unadapted to the nature of the Russian people, he nevertheless must be regarded as the creator of modern Russia, which he first brought into the state system of European nations. The 'testament' attributed to him, defining his policy, is probably spurious, but it doubtless expresses, with some elaboration, his ideas. Consult: Schuyler, *Peter the Great* (New York, 1884), one of the best biographies in English; Motley, "Peter the Great," *North American Review* (October, 1845), a notable essay, since republished; Mintzlof, *Pierre le Grand dans la littérature étrangère* (Saint Petersburg, 1872), containing bibliographical notes on 1200 works not Russian relating in some way to Peter; Bergmann, *Peter der Grosse* (Königsberg-Riga-Mittau, 1823-30); Barrow, *The Life of Peter the Great* (London, 1873); Brückner, *Peter der Grosse*, in the Oncken series (Berlin, 1879). Among Russian works, mention should be made of Solovieff, Milionkoff, and Philippoff.

PETER II., ALEXEYEVITCH (1715-30). Emperor of Russia from 1727 to 1730. He was the son of Alexei, heir of Peter the Great, who perished in prison, and was born in Saint Petersburg, October 22 (11), 1715. He ascended the throne on the death of Catharine I., May 17, 1727, and immediately fell under the influence of the ambitious Menshikoff, who affianced the youthful Czar to one of his daughters. Menshikoff, however, was soon overthrown by the Dolgoruki, who succeeded to his power. Peter was crowned in 1728, and in the following year was betrothed to a member of the Dolgoruki family. The marriage was set for February 2, 1730, but a few days previously the Czar was stricken down by smallpox and died on February 9 (January 29). He was succeeded by Anna Ivanovna (q.v.).

PETER III., FEODOROVITCH (1728-62). Emperor of Russia in 1762. He was a grandson of Peter the Great by his daughter Anna, who was married to Duke Charles Frederick of Holstein-Gottorp, and was born at Kiel, March 3 (February 21), 1728. By the Empress Elizabeth Petrovna (q.v.) he was nominated successor to the throne. In 1745 he married Sophia Augusta, a princess of Anhalt-Zerbst, who, on entering the Greek Church, assumed the name of

Catharine. Peter succeeded Elizabeth on her death, January 5, 1762. His first act of authority was to withdraw from the alliance with France and Austria against Prussia, restoring to Frederick II. the province of East Prussia, which had been conquered during the Seven Years' War, and sending to his aid a force of 15,000 men—a line of conduct which seems to have been prompted solely by his admiration for the Prussian sovereign. He also recalled many of the political exiles from Siberia, among whom were L'Estocq, Münnich, and Biron, Duke of Courland; abolished many of the oppressive police laws; reduced taxation; initiated measures for the revival of Russian industries and commerce; and attempted a reorganization of the army and navy. He also attempted to reconquer for the House of Holstein-Gottorp the portion of Schleswig which had been ceded to Denmark in 1713. Peter's pro-German tendencies, however, his liberal policy, his indifference to the Greek Church, and his ill-concealed contempt for Russian manners and customs, made him hated by his subjects. His wife had still deeper cause for dislike: for though he was himself addicted to drunkenness and debauchery, he never ceased to reproach her with her infidelities, and had even planned to divorce her, disinherit her son Paul (q.v.), and elevate his mistress, Elizabeth Vorontsoff, to the throne. A formidable conspiracy, headed by Catharine, and supported by the principal nobles, was formed against him. On the night of July 8, 1762, Peter was declared to have forfeited his crown, and his wife was proclaimed Empress as Catharine II. by the guards, the clergy, and the nobility. Peter, who was then at Oranienbaum, neglecting the counsels of Field-Marshal Münnich, who proposed to march at once on the capital at the head of the regiments which were still faithful, soon found even the opportunity of flight cut off, and was compelled to submit. He abdicated the throne on July 9th, and on the 17th of the same month was put to death by Gregory Orloff to secure the safety of the conspirators.

PETER I., KARAGEORGEVITCH (1846—), King of Servia. He was born at Belgrade in 1846. His grandfather was George Petrovitch, known as Kara (Black) or Czerny George (q.v.), who led the Servians in their struggle for independence against the Turks, and in 1812 was recognized by the Sultan as Prince of Servia. Peter's father Alexander was elected Prince of Servia in 1842, to succeed Michael Obrenovitch, but in December, 1858, he was declared deposed by the National Assembly, and in the following month left the country. With him went Peter, who was put to school in Hungary, made frequent visits to Russia, and finally entered the French military school of St. Cyr. He graduated there and became an officer in the French army. After the outbreak of the Franco-German war he served with distinction under Bourbaki, notably before Villersexel. Three times he was captured by the Germans and as often escaped. For several years he followed a life of extravagance and dissipation in Paris, and then, aroused by the troubles in the Balkans, actively encouraged the rising of 1875-76 in Herzegovina, which culminated in the Russo-Turkish war of 1877-78 and the complete establishment of Servian independence. After a period of roving he went to Montenegro, and in August, 1883, married the Princess Zorka (born 1864), eldest daughter of Prince Nicholas. Eventually this marriage served to connect him with the Russian and Italian courts, since Zorka's sister Militza married the Grand Duke Peter Nikolaievitch and her sister Helena became the consort of Victor Emmanuel II. The permanent residence of Peter and Zorka was at Cettinje, but frequent visits to Paris were made. After Zorka's death (1890), Peter became estranged from his father-in-law and went to Geneva to educate there his three children, a girl aged five and two boys aged three and two. From that time until 1903, though a recognized 'pretender,' he lived quietly in Switzerland. On June 11, 1903, King Alexander of Servia, of the rival house of Obrenovitch (q.v.), and Queen Draga were murdered, and four days later Peter was elected King of Servia by the Skupshtina. After an absence of forty-four years he entered Belgrade on June 24th and on the following day took the oath of office. He was credited with liberal views and with pro-Russian sympathies. See SERVIA.

PETER OF BLOIS, blwä (c.1135-c.1208). An English prelate and author, born at Blois of a Breton family, and well educated at Paris and Bologna. For two years he was tutor to William II. of Sicily and keeper of the royal seal, and about 1173 entered the employ of Henry II. of England, who sent him to Paris and to Rome. Peter became secretary to the Archbishop of Canterbury in 1176, a post he continued to hold under Baldwin, who succeeded to the see in 1184, and in whose behalf he was employed at Rome for a time. After the death of Henry II., Peter acted (1191-95) as secretary to Queen Eleanor. He had been appointed Archdeacon of London in 1192, and, if he be identified with the Canon of Ripon bearing the same name, must have lived as late as 1208. He was a vain and ambitious man, well versed in Latin, and a very able secretary, as he could dictate three letters and write a fourth himself simultaneously. Among his many works the *Epistles*, published in 1480 at Brussels, are of the most worth.

PETER THE CRUEL, King of Castile. See PEDRO THE CRUEL.

PETER THE HERMIT, or PETER OF AMIENS (c.1050-1115). The preacher of the First Crusade. He was born in the city or at least in the diocese of Amiens about 1050. The stories told of his early life, that he was a soldier, married, and had several children, are fictitious. It is believed that he undertook a pilgrimage to the Holy Land, but did not reach Jerusalem. After the Council of Clermont in 1095 (See CRUSADE: URBAN II.) Peter appeared as a preacher of the Crusade in Northern and Central France. He rode on a mule, with a crucifix in his hand, his head and feet bare; his dress was a long robe and a hermit's cloak of the coarsest stuff, girt with a cord. He preached with the greatest earnestness in the pulpits, on the roads, and in the marketplaces, and everywhere aroused his hearers to a high pitch of enthusiasm, and was honored as a saint inspired from heaven. As early as April, 1096, Peter reached Cologne with a following of 15,000 men, and there his army received an accession of 15,000 more. They were mostly from the lower classes, poorly organized, and little fitted for war or the hardships before them. In dis-

[illegible] they made their way through Germany and Hungary toward Constantinople. (See CRUSADES.) Peter himself reached the city in July, 1096, accompanied his army across the Bosporus. But, disgusted by the insubordination of his followers, he returned to Constantinople and gave up the attempt to act as leader. During the siege of Antioch in 1098 he made a cowardly attempt to run away, but nevertheless was soon after trusted with a difficult commission to Kerbuga, King of Mosul, and acquitted himself with credit. During the winter of 1098-99, when many wished to abandon the Crusade, Peter appeared in his old rôle of preacher urging its continuance. He tried to defend the poor against the selfishness of the leaders. On the 8th of July, 1099, he preached on the Mount of Olives. After the capture of Jerusalem (July 15, 1099) he remained in the city, while the army proceeded toward Egypt. He returned home, probably shortly after the battle of Ascalon, and became monk and prior at Neufmoustier, near Huy, in the Diocese of Liège, where he died July 8, 1115. Consult, besides the general works on the Crusades, Hagenmeyer, *Peter der Eremit* (Leipzig, 1879); Franz, *Peter von Amiens* (Hofgeismar, 1891).

PETER THE VENERABLE (c.1094-1156). Abbot of Cluny. He was born at Montboissier, was educated in a Cistercian monastery, took the monastic vows in Cluny (1111), and was chosen prior of the famous monastery there when only twenty-eight years old. He cultivated learning and piety, and exemplified both in his own life. He visited England and Spain, and was in the Council of Pisa (1134). It is related that he reconciled the kings of Castile and Aragon, and that he advocated the claim of Innocent II. to the Papal throne, and secured his general acceptance by the Church. He also befriended Abélard, and gave him a refuge in the Monastery of Cluny for the close of his troubled life. Peter died at Cluny, December 25, 1156. Three of his treatises deserve separate mention: (1) *Against the Jews;* (2) *Two Books of Famous Miracles* (French trans. by d'Avenel, Paris, 1874); (3) *Against the Execrable Sect of the Saracens.* In the last work he shows considerable knowledge of his subject; he had a condensed Latin translation of the Koran made by his secretary, Peter of Poitiers, which was long the only one extant; it was edited by Bibliander and published at Basel in 1543. Unfortunately, only two of the five books of this treatise are extant. He also wrote against the Petrobrusians. (See BRUYS, PIERRE DE.) Peter's letters are important for the history of the period. His writings are collected in Migne, *Patrol. Lat.*, clxxxix. For his life, consult Wilkens (Leipzig, 1857) and D'Avenel (Paris, 1874).

PETER, APOCALYPSE OF. See APOCRYPHA, section on *New Testament*.

PETER, EPISTLES OF. Two of the seven so-called Catholic Epistles of the New Testament.

I. PETER. This document, according to its address, signature, and closing paragraph (i. 1-3 and v. 12-14), is a letter written by the Apostle Peter to the Christians of Asia Minor and sent thither by Silvanus, probably the Silas mentioned in Acts (xv. 22 onward). The Epistle was written to admonish and encourage those addressed to a cheerful, manly patience in persecution, to an orderly life, and to a steadfast hope. The doctrinal teachings are set forth incidentally to give the necessary foundation to the exhortations. The hortatory character of the Epistle makes it difficult to analyze satisfactorily. The following outline is suggested: After the usual address, signature and salutation (i. 1-2), the author fervently expresses his praise to God for the *Christian salvation*, the object and end of their sorely tried faith, foreshadowed in prophecy and now eagerly awaited (i. 3-12). This prepares for the three series of exhortations that follow. In the *first* (i. 13-ii. 10) the readers are exhorted to *earnestness, obedience*, and *holiness* with *godly fear* in view of the cost of their redemption (i. 13-21), to the exercise of brotherly love, as all of one divine regeneration (i. 22-25), and to a vital union with Christ, the chief corner stone (ii. 1-10). The *second* series (ii. 11-iv. 11) urges to orderly life (ii. 11-12), to all due subjection to constituted authority, even if suffering should ensue, citing the example of such suffering set by Christ (ii. 13-25); then passes to exhort wives to reverence their husbands (iii. 1-7), adding a general exhortation to all to be orderly, forbearing, and forgiving (iii. 8-12). In case this loyalty involves suffering, let them remember Christ's vicarious suffering and its blessed results, conform their conduct to His, and place their faith in Him, the risen Lord, especially since the end is near (iii. 13-iv. 11). The *third* set of exhortations (iv. 12-v. 11) pleads with those who are addressed not to take offense at the trials they are undergoing. If they are for loyalty to Christ, all is well. They must not suffer as evildoers (iv. 1-19). The church officers and members are urged to faithful performance of duties (v. 1-7), and the final exhortation to watchfulness is followed by a benediction (v. 8-11). The Epistle closes by stating that it is sent by Silvanus and with greetings from the church (or wife?) in 'Babylon' and from Mark. A short benediction is added (v. 12-14).

The doctrinal teachings of Peter, compared with those of the Pauline Epistles, are marked by a greater simplicity. They move within the sphere of Jewish-Christian thought and may be accounted for and explained on the basis of the application of the conviction that Jesus was the Messiah to the teachings of the Old Testament. The conception of God is that of the Old Testament, supplemented by the emphasis laid by Jesus on His Fatherhood (i. 3, 17). There is no distinctive Christology. Jesus is spoken of after the same manner as in the first chapters of Acts and in the Synoptic Gospels. The doctrine of redemption is fundamentally the same as that of Paul, but expressed differently, mainly in Old Testament language, and influenced largely by a deep appreciation of the human elements of Jesus' passion. The resurrection is the great fact that crowned the Messianic work of Jesus (i. 3, 11), and faith is fixed on that as well as on His death (iii. 22). The Christian life is founded on a vital union with the now living and glorified Jesus (i. 23-ii. 5). Salvation affects the real life, the 'soul' (i. 9 sqq.), and begins here through the new birth by the agency of the Word (i. 23). It becomes a possibility through *faith*, a word of broad significance in I. Peter, including the whole obedient response to the will

of God expressed in the life and work of Jesus the Messiah. The positive teachings concerning salvation reveal strong convictions concerning sin and its seat in man's being. The eschatology of I. Peter is simple. The future life is of far greater importance than this. We are only pilgrims here, and on that future we should fix our attention. It will be ushered in by a new revelation of Christ and will be an eternity full of glory (i. 7, 10; v. 10). The church organizations appear to have been simple. Elders are at the head and the younger element are urged to obey the older. As to baptism, not the form, but the heart condition is the important element (iii. 21).

The Epistle has been subjected to severe criticism. The central question is that of its genuineness. Is it what it purports to be? The external evidence in its favor is remarkably strong. All the prominent writers at the end of the second century, as well as Papias and Polycarp, early in the first century, used it as Peter's. No doubt as to its genuineness was expressed in the ancient Church.

The internal evidence in favor of Peter's authorship may be stated as follows: (1) The opening and closing sections, in which the writer calls himself the Apostle Peter, addresses a specific circle of Christian communities, states the name of the bearer of the Epistle (Silvanus), and sends greetings from Mark. Both Silvanus and Mark were fellow workers with the Apostles and members of the primitive Christian community of Jerusalem. If these sections state the truth, the genuineness of the Epistle must be admitted. If they are to be rejected as fictitious, strong grounds must be given for the rejection. (2) Incidentally, and without undue display, the writer represents himself as one who was an eye-witness of Jesus' ministry and passion (cf. i. 8, v. 1, and the warm-hearted way in which Jesus' sufferings are spoken of). (3) The independent character of the thought of the Epistle is, at least, not against its genuineness. The brief sketch of the teachings of the Epistle given above reveals this. While the writer comes close to Paul's language at times, he is no mere echo of Paul, nor is he a blundering copyist. (4) There is a genuine and serious tone and purpose to the Epistle, exhorting its readers to all that is good, which makes it difficult to account for as a forgery.

The main objections to Petrine authorship based on internal evidence are: (1) The trials or persecutions referred to imply a date later than the end of Peter's life. In regard to this it may be said that the statements in the Epistle do not imply a regularly organized *State* persecution of Christians as such. The general opposition of the pagan world and of the Jewish element are sufficient to account for all that is said. That this opposition was severe in Apostolic days the letters of Paul and the record in Acts abundantly testify. It is not necessary to presuppose even the persecution of Nero as implied in the Epistle. Such a passage as ii. 13 sqq. does not point that way. (2) The Epistle is said to manifest great dependence on Paul's writings, which, it is thought, militates strongly against Petrine authorship. In regard to this it may be replied: (a) There is no inherent impossibility in the supposition that Peter may have known and valued Paul's writings and used expressions from them in a writing of his own. (b) It is probable that a literary relationship exists between our Epistle and Romans and Ephesians. But it may be, as Weiss and Kühl claim, that Paul is here dependent on I. Peter. (c) In any case the author of I. Peter is master of his own thought and language. In this short Epistle he uses at least sixty words not found elsewhere in the New Testament, and gives to many common words a special, peculiar sense. (3) The Greek of I. Peter, though not so good as that of II. Peter, is said to be of a quality far beyond the capability of Peter, an ignorant Galilean fisherman. But the fact is, we know nothing of Peter's knowledge of Greek. That language was largely spoken in Galilee, and Peter may have gained some proficiency in it. He may, however, have used Mark or Silvanus to write the Epistle, dictating the matter in Aramaic and leaving the writer to put it into popular Greek. Other objections hold against certain theories regarding the date, place of writing, and class of Christians addressed, but not against the Epistle *per se*.

We may affirm, then, that the general character of the Epistle and its history in the Church are not opposed to its own claim to be an epistle of the Apostle Peter. It only remains to consider the questions of destination and date. The plain, literal sense of the words, "to the elect sojourners of the dispersion," etc., indicates *Jewish*-Christian communities in the various provinces of Asia Minor as the parties addressed. The main objections to this view are that, according to Acts and Paul's Epistles, the Christianity of Asia Minor was overwhelmingly *Gentile*-Christian, and that no epistle addressed to Jewish-Christians would have used such language as we find in i. 18 and iv. 3-4. These objections are strong, though not conclusive. The work of Paul covered half of the territory indicated in the address, and many Jewish-Christian workers may have labored in Northeastern Asia Minor and even in the regions traversed by Paul. The second objection is more serious, but it cannot be said that Peter could not have used such language in addressing churches which, though composed mostly of Jewish-Christians, still contained some converts from paganism.

It is possible, however, to take the word 'dispersion' in a figurative sense and consider that the Epistle was addressed to Christians as such, whether of Jewish or pagan ancestry. In some parts of Asia Minor the former may have predominated; in other parts, especially in the western districts, the latter. It was only natural that the Apostle, himself a Jewish-Christian whose experience had been mainly with Jewish-Christians, should address them all as the true Israel. Since Paul had evangelized only a part of Asia Minor, an epistle addressed to churches scattered through the whole vast province had no occasion to mention him. It is probable that by 'Babylon' (v. 13) Rome is intended. Whether the term 'fellow elect' (fem.) means the Church or some individual (the writer's wife?) is a question.

The date to be assigned to the Epistle depends mainly on the answers to two questions: (1) To what do the references to suffering point? If nothing less than a State persecution is implied, the time of the persecution by Nero is the earliest possible date—i.e. c.64 A.D. If no State persecution is implied, the Epistle may well have

been [illegible]r. (2) The question of the relation between Peter and the Pauline Epistles. If I. Peter is dependent on Romans and Ephesians, it must be dated either after Paul's first imprisonment, i.e. after 61, while Paul was away from Rome, or during that imprisonment, while Paul also was in the city. Most critics who hold to the genuineness of the Epistle and to its dependence on Paul are inclined to a date near 64 A.D. Ramsay (*The Church in the Roman Empire*, pp. 279-295, Oxford, 1893) advocates 80 A.D. Those who dispute Peter's authorship assign different later dates. But if the dependence is on the side of Paul rather than Peter, the Epistle was written before Romans. This opinion, advocated by Weiss and Kühl, has much in its favor, and appears, on the whole, the most probable. Accordingly the Epistle may be viewed as written at Rome some time between 50 and 55 A.D.

II. Peter. This Epistle purports to be from the Apostle Simon Peter to (an unnamed circle of) Christians. After exhorting them to fulfill their high destiny by a complete, well-developed Christian life (i. 3-11), he declares his purpose ever to remind them of these things, especially as he knows that his death is near, and is certain of the truth of the doctrines of the power and Second Coming of Christ (see Second Advent of Christ), both from his own experience at the Transfiguration, and from the more sure word of prophecy (i. 12-21). He then passes to his main theme, warning against the threatened inroads of false teaching represented by bold, irreverent, reckless Antinomianism and by a skeptical denial of the Second Coming (ii. 1-iii. 13). The Epistle closes with a reference to Paul as teaching the same truths, though often misunderstood, and by an exhortation to constant Christian growth (iii. 14-18).

Unlike I. Peter, this Epistle seems to have been called forth by some very urgent conditions in certain Christian communities. Its scope is not so broad nor its teachings so diversified as is the case with I. Peter. Only in the very condensed passage i. 3-11 is a comparison between the two Epistles possible.

Because of its somewhat unique character, II. Peter has proved an inviting field for biblical criticism, and the questions of its authorship, date, and destination are still open. The external attestation to the Epistle is probably weaker than in the case of any other New Testament writing. There is no distinct trace of its existence before Origen, though it is probable that it was commented on by Clement of Alexandria (c.190). We must then be content with such evidence as the Epistle itself offers. Petrine authorship is, without doubt, claimed, not only in the opening words, but in the reference to the Apostle's death, as revealed by the Lord (i. 14), in the reference to the Transfiguration (i. 16), and in the notice of Paul's letters (iii. 15). Nevertheless, grave objections may be made against this claim. Arguments drawn from the vocabulary and style of the Epistle are not of great weight, because of our imperfect knowledge of Peter's habits and circumstances. The remarkable, almost verbal similarity between II. Peter ii. 1-iii. 3 and the short Epistle of Jude demands explanation. If, with most modern scholars, we hold that this section of the Epistle was copied from Jude, it becomes very difficult to maintain the Apostolic authorship of II. Peter, not only on general grounds, but also because the errorists combated are spoken of in Jude as already in the community, while in the Epistle their appearance is still future, or at least indicated as very recent. It is much simpler, and more in accordance with the statements of both Epistles, to hold that Jude used II. Peter. If such be the case, Jude is additional evidence for the early date of the Epistle. Arguments based on the marked dissimilarity between I. and II. Peter are of force only as against the view that both Epistles were written near the same date by Peter's own hand, or by the same amanuensis and to the same circle of readers. No one of these suppositions, however, is necessary. The relation between II. Peter and apocryphal writings of Josephus is too uncertain for a basis of argument.

While conceding the great weight of opposing theories and the complicated and uncertain character of the evidence, the most probable view seems to be that the Epistle was written near the close of Peter's life, presumably from Rome, to Jewish-Christian readers, well known to the Apostle, who were threatened with the invasion of new and dangerous heresy. It had a limited circulation, but became known some years later to Jude, who used it as the basis for his hastily written Epistle to the same or nearly related communities.

Bibliography. The recent and able commentaries by Kühl, in Weiss's series (Göttingen, 1897); Bigg, International Critical Series (New York, 1901); and Von Soden, in the Holtzmann Series (Leipzig, 1899), are full and leave little to be desired. Chase, in the Hastings *Dictionary of the Bible*, gives an exhaustive treatment with a good bibliography. For the theology of I. Peter, consult the standard New Testament theologies of Weiss, Beyschlag, Holtzmann, Stevens, and also Weiss, *Der petrinische Lehrbegriff* (Berlin, 1855). The various introductions to the New Testament, and works on the Apostolic Age contain full discussions of the critical problems. For II. Peter consult also Spitta, *Der zweite Brief des Petrus und der Brief des Judas* (Halle, 1885).

PETER, Gospel of. See Apocrypha, section on *New Testament*.

PETER, Preaching of. See Apocrypha, section on *New Testament*.

PETER, pā'tēr, Hermann (1837—). A German classical scholar, son of the following, best known for his work in Roman history. He was born at Meiningen, studied at Bonn and Breslau, taught at Posen, Frankfort-on-the-Oder, and Meissen, and in the last place became rector of the school. His works include important editions of *Scriptores Historiæ Augustæ* (1865; 2d ed. 1884; and critical essays on the same subject, 1892); *Historicorum Romanorum Reliquiæ* (1870); and *Historicorum Romanorum Fragmenta* (1883), as well as Ovid's *Fasti* (1874; 3d ed., 1899); and the critical essays, *Die Quellen Plutarchs in den Biographien der Römer* (1865), and *Die geschichtliche Litteratur über die römische Kaiserzeit bis Theodosius I. und ihre Quellen* (1897).

PETER, Karl Ludwig (1808-93). A German historian and classical scholar. He was born at Freiburg and studied at Halle. For several years he served as professor of history in the University of Jena. His writings include: *Die*

Epochen der Verfassungsgeschichte der römischen Republik (1841); *Geschichte Roms* (4th ed. 1881); *Studien zur römischen Geschichte* (1863); and *Zur Kritik der Quellen der ältern römischen Geschichte* (1879).

PETER BELL. A tale in verse by William Wordsworth (1819) of a man in humble life, with incidents of such exaggerated simplicity as to provoke much ridicule.

PE'TERBOROUGH. An episcopal city, a Parliamentary and municipal borough, and a civic county, known as the soke or liberty of Peterborough, in Northamptonshire, England, on the Nen, 37 miles northeast of Northampton, and 76 miles north by west of London (Map: England, F 4). Its principal edifice is the famous cathedral, which has undergone complete restoration since 1883, and holds a high rank among English cathedrals of the second class, exhibiting all grades of transitional architecture from Norman to Perpendicular. The south transeptal crypt incloses the site of the prior cruciform Saxon church. The west front as a portico is said to be the finest in Europe. A central tower, lantern-shaped, rises at the intersection of the nave and transept. The length of the cathedral is 476 feet; breadth at the great transepts, 203 feet; height of central tower from the ground, 150 feet. The town is regularly laid out, has an excellent grammar school with an endowment, a public library, a school of art, science, and technology, a corn exchange in the Italian style, a jail and house of correction, a handsome parish church, and a number of charitable institutions. The city owns its water and electric lighting works, markets, sewage farm, bathing place, and isolation hospital, maintains parks and recreation grounds, and provides cottage allotments. Peterborough is an important railway centre and carries on an active trade in corn, coal, timber, bricks, and malt. It has also manufactures of agricultural implements and extensive locomotive works.

Anciently named Medeshamstede, the city had its origin in a great Benedictine monastery, founded in 655. This monastery, reared in honor of Saint Peter, became one of the wealthiest and most important in England, but it was not until after having been destroyed by the Danes in 807, and rebuilt about 966, that the town was called Peterborough. On the dissolution of the monasteries, the magnificent cathedral was spared, owing, it is supposed, to its containing the remains of Queen Catharine of Aragon, but it was vandalized by Cromwell and his troopers in 1643. Population, in 1801, 3400; in 1851, 8700; in 1881, 21,228; in 1901, 30,870. Consult: Poole, *Peterborough* (London, 1881); Davys, *The Cathedral and Abbey of Peterborough* (Peterborough, 1886); Sweeting, *Peterborough Cathedral* (London, 1898).

PETERBOROUGH. The capital of Peterborough County, Ontario, Canada; on both sides of the Otonabee River and on the Canadian Pacific and the Grand Trunk railroads, 76 miles northeast of Toronto (Map: Ontario, E 3). It is connected by a handsome bridge with the village of Ashburnham opposite. The town is lighted with gas, has good water power, manufactures leather, engines, farming tools, wooden ware, and woolens, and carries on a large export trade in grain, pork, and lumber. It is the seat of a United States consular agent. The town is the centre of a picturesque lake and river district, and is a favorite resort for sportsmen; the Peterborough or Rice Lake canoe was invented here. Population, in 1891, 9717; in 1901, 11,239.

PETERBOROUGH, CHARLES MORDAUNT, third Earl of (1658-1735). An English military and naval commander. He served as a boy in the navy, and then entered the army. For the prominent part that he took against James II., he was made Earl of Monmouth by William III., succeeding afterwards to the earldom of Peterborough, as heir to his uncle. During the War of the Spanish Succession the English expedition to the Iberian Peninsula was placed under his command, and in June, 1705, he arrived in Lisbon with 5000 Dutch and English soldiers. After taking on board the Archduke Charles of Austria, who claimed the Spanish crown, the armament proceeded to Valencia. Mordaunt conceived the idea of making a dash at Madrid, and finishing the war at one blow, but was overruled by the Archduke and the Prince of Hesse, and compelled to besiege Barcelona, which was defended on one side by the sea, and on the other by the strong fortifications of Monjuich. By a *coup de main* he made himself master of Monjuich, Barcelona fell, and Mordaunt pushed his successes into the interior. Several towns submitted. He marched to Valencia and at the head of 4200 men defeated a Spanish force of 4000. The Spaniards sent a large army into Catalonia, and a French fleet appeared off Barcelona. Mordaunt returned to Barcelona, harassed the enemy's army, and, putting himself on board the English squadron, directed a movement which compelled the Frenchmen to put to sea, and Barcelona was saved. Mordaunt again wished to march toward Madrid, but his plan for gaining possession of the capital was once more rejected by Charles. He accordingly left the army in a fit of pique, and went to Italy. In 1707 he returned to Valencia as a volunteer, but the excellent advice which he gave was not followed. He was recalled to England, and from that moment the tide of fortune ran strong against the Austrian cause. On his return he made common cause with the Tories, and received the Garter and other dignities for his services. On the accession of George I. he was appointed commander-in-chief of the naval forces of Great Britain. He died at Lisbon. Brilliant and versatile, he was also eccentric and erratic. His witty yet affectionate letters to Pope, Swift, Prior, etc., give a fine insight into his private character. His character has been sketched by Horace Walpole, in his *Catalogue of Royal and Noble Authors*, and with still greater force and picturesqueness by Macaulay. Attempts have been made to discount the brilliancy of his leadership in the Spanish campaign and to attribute the successes to other officers, but these have signally failed. Consult: Warburton, *Memoirs of Charles Mordaunt, Earl of Peterborough and Monmouth* (London, 1853); Russell, *Memoir of Charles Mordaunt, Earl of Peterborough* (ib., 1887); Stebbing, "Peterborough," in *English Men of Action* (ib., 1890).

PE'TER CLA'VER, SAINT (1580-1654). The apostle of the negroes in Spanish America. He was born in Catalonia of a noble family. After completing his education in the Jesuit college at Barcelona, he joined the novitiate of the Society at Tarragona in 1602, and

was [illegible] the newly founded college at Montrege. While he was still pursuing his studies, the general, Aquaviva, called for an approved missionary from each Spanish province of the society to go to the newly formed province of Granada in South America. Peter Claver was among those chosen, and arrived at Cartagena, then the centre of the African slave-trade, in 1610. In 1616 he was ordained, and entered on his special work. He won the approval of the authorities for his plan, and secured orders that no slave-owners should be allowed to carry off the newly imported blacks until they had had instruction in the Christian faith. He signed himself the 'slave of the negroes forever,' and practically lived among them, on shipboard and in the hospitals, especially the leprosy hospital, ministering to their wants, as well temporal as spiritual. His exertions during the plague in Cartagena resulted in utter exhaustion and paralysis, and he died September 8, 1654. He was beatified by Pius IX. in 1852, and canonized by Leo XIII. in 1888. Consult his *Life* by Fleuriau (Eng. trans. London, 1847) and Höver (Düllmen, 1888).

PETER DE VIN'EA (c.1190-1249). An Italian statesman and jurist, born at Capua. By his abilities he attracted the attention of Emperor Frederick II., and as early as 1225 he appears as occupying a high judicial position in Frederick's kingdom of Sicily. He soon became the chief judicial officer in the realm, and aided in drawing up the Constitution of 1231 for Sicily, which was far in advance of any other instrument of government of Western Europe at that period. After filling other very high offices, Peter was suddenly arrested on suspicion of having been bribed to poison the Emperor. It is said that, in order to avoid torture and further disgrace, he dashed out his brains against a pillar, to which he had been chained. Dante has sought to clear his good name, and many beautiful legends arose concerning the tragic fate of the great statesman. His letters, poems, and speeches form one of the most useful sources for the history of his time. Consult: Huillard-Bréholles, *Vie et correspondance de Pierre de la Vigne* (Paris, 1865); Kington, *History of Frederick II.* (London, 1862).

PE'TERHEAD. A seaport and Parliamentary burgh in the District of Buchan, Aberdeenshire, on a peninsula, the easternmost point of land in Scotland, 14 miles northeast of Aberdeen (Map: Scotland, G 2). Keith Inch, the eastern head of the peninsula and the nucleus of the town, mainly occupied by fish-curing establishments, is now separated by a canal which connects the five spacious harbors. The town is irregularly built, clean, and paved with the reddish granite named after the town, but has no striking edifices. The parish church has a granite spire, 118 feet high, and a granite Tuscan pillar stands on the market-cross. There are Episcopal, Free, Roman Catholic, and other churches; an academy and other schools, and libraries. The town owns its water supply, winter and summer baths, and a municipal lodging house. Formerly the chief British depot of the whale and seal fisheries, it is now noted for its herring fishery, employing over 500 boats and 5000 persons. The general trade is of considerable importance. The chief exports are herrings, cattle, agricultural produce, and granite. Granite and polishing works, ship and boat building, woolen factories, and breweries are carried on. Peterhead dates from the thirteenth century. The Pretender landed here on December 25, 1715. Population, in 1891, 12,200; in 1901, 11,750.

PETERHOF, pā'tĕr-hŏf. A town in the Government of Saint Petersburg, Russia, situated on the Gulf of Finland, 18 miles west of the capital (Map: Russia, D 3). It is a well laid-out town, occupied chiefly by fine villas and summer residences which extend along the gulf to Oranienbaum on the west and Saint Petersburg on the east. The royal palace, with its extensive gardens, fountains, and statues modeled after those at Versailles, was begun by Peter I. in 1711, and has since been greatly extended and embellished by the successive monarchs, especially by Elizabeth, Catharine II., and Nicholas I. It contains many rare works of art. Peterhof is now one of the most fashionable resorts around the capital, and the Russian Court usually spends there a part of the summer. Population, in 1897, 11,300.

PE'TER IB'BETSON. A novel by George Du Maurier (1891). It appeared serially in *Harper's Magazine* of that year. The story opens with Peter's childhood in Paris, and his playmate, Mimsey Seraskier. Left an orphan, he is brought up by a disagreeable uncle. He meets Mary, the charming Duchess of Towers, and discovers in a dream that she is Mimsey. Exasperated by his uncle, Peter kills him in a sudden frenzy, and for twenty-five years in prison he leads a dream life in which he has mysterious communication with the Duchess. At her death he becomes insane; she comes to him once afterwards and influences him to write this curious autobiography.

PETER LOMBARD, or PETER THE LOMBARD (c.1100-64). An Italian theologian. He was probably born at Lumello, in Lombardy, about the year 1100. He studied at Bologna, Rheims, and later at Paris, where he was a pupil of Abélard. He became teacher of theology in the cathedral school of Notre Dame, and in 1159 was appointed bishop of Paris. He resigned the see after a year and died at Paris, July 20, 1164. He was very generally styled *Magister Sententiarum*, or *Master of the Sentences*, from his compilation *Sententiarum Libri IV.*, a collection of sentences from Augustine and other Fathers on points of Christian doctrine, with objections and replies also collected from authors of repute. It was intended as a manual for the scholastic disputants of his age, and as such was used for 500 years and made the basis of innumerable lectures and treatises. It was one of the first books printed, and many editions have been issued. It is found in Migne, *Pat. Lat.*, vols. cxci-cxii., with his *Catena* on the Psalms and on Paul's Epistles. Consult the treatise of Protois, *Pierre Lombard, son époque, sa vie, ses écrits, son influence* (Paris, 1881).

PE'TERLOO MASSACRE (fanciful name, suggested by *Waterloo*). The name popularly given to the dispersal of a large meeting by armed force in Saint Peter's field, Manchester, England, Monday, July 16, 1819. The assemblage, consisting chiefly of bodies of operatives from different parts of Lancashire, was called to consider the question of Parliamentary reform. The dispersal took place by order of the magistrates. Eleven persons were killed and more than 500 wounded.

PETERMANN, pā'tĕr-mân, AUGUST (1822-78). A German geographer. He was born at Bleicherode, in Prussian Saxony; studied at Nordhausen; and from 1839 to 1845 was an assistant in the geographical academy of Professor Berghaus at Potsdam. There he worked upon Berghaus's *Physikalischer Atlas*, and drew the map for Alexander von Humboldt's *Asie Centrale*. In 1845 he went to Edinburgh as assistant to A. K. Johnston in the preparation of his *Physical Atlas*, based upon the publication of Berghaus. In 1847 Petermann founded a cartographic establishment at London, and was elected to the Royal Geographical Society. He then made a special study of the geography of Africa and of the Arctic Zone. In 1854 he returned to Germany to assume the directorship of Justus Perthes's geographic institution at Gotha, and in 1855 founded the *Mittheilungen*, a monthly geographical journal, which remains the authoritative publication in its particular department. Like his father and his brother before him, he died by suicide.

PETERMANN, JULIUS HEINRICH (1801-76). A German Oriental scholar. He was born at Glauchau, was educated at Leipzig and Berlin, and studied Armenian at Venice. In 1837 he became professor of Oriental languages at the University of Berlin. From 1852 to 1855 he traveled through Asia Minor and Persia; in 1867-68 through Palestine and Syria; during the latter year he was German consul at Jerusalem. Petermann published grammars of the Samaritan, Aramaic, and Armenian languages in the *Porta Linguarum Orientalium* series. Among his other works are *Reisen im Orient* (1860-61), and an edition of the *Samaritan Pentateuch* (1872 seq.), continued after his death by Vollers.

PETER MARTYR. The name most commonly applied to PIETRO MARTIRE DI ANGHIERA (c.1457-1526), an Italian writer on American history. He was born at Arona, in Northern Italy, probably on February 2, 1457, although his own letters give almost equally good grounds for the years 1455 and 1459 as the date of his birth. In 1477 he went to Rome, where, through the Cardinal Ascanio Sforza, he secured the position of secretary to Francesco Negro, the Governor of the city, which he held until August, 1487, when he was induced to go to Spain by the retiring Spanish Ambassador, the Count of Tendilla. There he seems to have quickly become a chronicler, and in this capacity he came under the immediate protection of the Queen. In 1494 he was ordained as a priest and became tutor to the children of Ferdinand and Isabella. In 1501 he was intrusted with a diplomatic mission to the Sultan of Egypt, who had threatened to massacre all Christians in his domains in revenge for the expulsion of the Moors from Spain. Martyr's account of his successful visit to Cairo is narrated in his *Legatio Babulonica*, which he dedicated to Pope Leo X. In reward, he received an appointment as apostolic prothonotary. In 1505 he also obtained the post of dean of the chapter of the Cathedral of Granada, which he held until his death. In 1520 he was appointed royal chronicler or historiographer, and subsequently a member of the Council for the Indies. His principal works are the history of the New World, *De Rebus Oceanicis et Novo Orbe Decades*, and the *Opus Epistolarum*. The *Decades* constitute an important source for the early period of American discovery. The *Opus* is an invaluable collection of 816 letters dealing with contemporary events. Consult: Mariéjol, *Pierre Martyr d'Anghiera, un lettré italien a la cour d'Espagne* (Paris, 1887); Bernays, *Petrus Martyr Anglerius* (Strassburg, 1891); Thacher, *Christopher Columbus* (New York, 1903).

PETER MARTYR. A sixteenth century religious reformer. See VERMIGLI.

PETERS, pā'tĕrs, CHRISTIAN AUGUST FRIEDRICH (1806-80). A German astronomer, born in Hamburg. He studied at Königsberg, was employed in the Altona Observatory, and in 1839 was appointed assistant at Pulkova. Ten years after, Peters became professor at Königsberg, and in 1854 was appointed director of the Observatory at Altona, and undertook the editorship of *Astronomische Nachrichten*. He went to Kiel in 1872, when the Observatory was transferred thither, and in 1873 he was chosen professor of astronomy in the university of that place. His work was almost entirely on stellar astronomy and dealt especially with stellar parallaxes, the constant of nutation, and the study of Sirius.

PE'TERS, CHRISTIAN HEINRICH FRIEDRICH (1813-90). A German-American astronomer, born at Koldenbüttel, in Schleswig. He studied in Berlin; worked in the observatories of Copenhagen and Göttingen, then under Sartorius von Waltershausen in the survey of Etna, and in the topographic bureau of Naples; and in 1854 came to the United States. For several years he was employed on the coast survey, and in 1858 was appointed professor of astronomy at Hamilton College, and director of the Litchfield Observatory. His greatest services to astronomy were the discovery of about fifty comets and planetoids, and the stellar charts published in 1882. Peters led the United States expedition to New Zealand for the observation of the transit of Venus in 1874.

PETERS, or **PETER**, HUGH (1598-1660). An English churchman and author. He was educated at Cambridge, was ordained, and preached at the Church of Saint Sepulchre, London, until he was silenced for non-conformity; he went to Rotterdam, and became pastor of the Independent Church. He was in New England from the winter of 1635-36 to 1641; was settled pastor of the First Church in Salem, Mass., as successor of Roger Williams. As chaplain in the Parliamentary army he rendered unusual services, for which he was rewarded under the Commonwealth and the Protectorate. After the Restoration, being suspected of complicity in the King's death, he was indicted for high treason, condemned, and beheaded, October 16, 1660. During his imprisonment he addressed to his daughter, Elizabeth, *A Dying Father's Last Legacy to an Only Child*. He published *Peters's Last Report of the English Wars* (1646); *A Word for the Army and Two Words for the Kingdom* (1647); *A Good Work for a Good Magistrate* (1651); and several other pamphlets. Consult Felt, *Memoir and Defense of Hugh Peters* (Boston, 1851).

PETERS, JOHN CHARLES (1819-93). An American physician; born in New York; studied medicine in Columbia and in Europe, and commenced practice in New York as a homœopathist, but afterwards joined the regular school. He published treatises on diseases of the head, of

[illegible] of the eyes, and Asiatic cholera. In collaboration with Dr. E. F. Snelling and others, he published a *Materia Medica*. Dr. Peters was editor of the *North American Journal of Homœopathy*, and of the *Transactions* of the Pathological Society.

PETERS, John Punnett (1852—). An American clergyman and Orientalist, born in New York City. He graduated at Yale (1873), and studied at Berlin and at Leipzig. He became professor of Old Testament languages and literature at the Protestant Episcopal Divinity School in Philadelphia (1884) and professor of Hebrew at the University of Pennsylvania (1885), and from 1888 to 1891 conducted excavations at Nippur. In 1893 he became rector of Saint Michael's Church, New York City. He wrote: *Scriptures, Hebrew and Christian* (1886-89); *Nippur, or Explorations and Adventures on the Euphrates* (1897); and *The Old Testament and the New Scholarship* (1901).

PETERS, pā'tĕrs, Karl (1856—). A German traveler. He was born at Neuhaus, in Hanover, and studied at Göttingen, Tübingen, and Berlin, where in 1880 he became privat-docent. In 1884 he founded the German Colonization Society, in whose interests he traveled through Eastern Africa. Returning to Germany in 1885, he became the head of the German East African Company, and two years later went again to Africa to assume the management of the colonial possessions. In 1888 he took the leadership of an expedition for the relief of Emin Pasha, marched up the Tana River to its source, and penetrated finally to the Victoria Nyanza. He crossed the lake in June, 1890, met Emin, already rescued by Stanley, and thence returned to the coast. In February, 1891, he was sent as Imperial commissioner to East Africa; founded a station at Kilimanjaro, and was active in the settlement of the boundary between German and English possessions. Accusations of cruelty toward the natives were in 1896 preferred against him. They were investigated before a judicial commission, and resulted in his dismissal from the service. In 1898 he went to London and formed a company for the exploration of the gold-fields of Rhodesia, and he himself visited Africa again in 1900-01. His publications include: *Willenswelt und Weltwille* (1883), a philosophical study; *Die deutsche Emin Pascha-Expedition* (1891); *Das deutsch-ostafrikanische Schutzgebiet* (1895); *Das goldene Ophir Salomos* (1895); and *Aequatorial und Südafrika nach einer Darstellung von 1719* (1895).

PE'TERS, Madison Clinton (1859—). An American clergyman, born in Lehigh County, Pa. He was educated at Franklin and Marshall College, and at Heidelberg Theological Seminary, Tiffin, Ohio, whence he entered the ministry of the Reformed Church, becoming pastor of the Bloomingdale Congregation in New York City. After a pastorate of eleven years he resigned, joined the Baptist Church, and became pastor of the Sumner Avenue Baptist Church, Brooklyn, N. Y. He defended this change of denomination in *Why I Became a Baptist* (1901). Among his other works are: *Justice to the Jew* (1899); *The Wit and Wisdom of the Talmud* (1900); *The Birds of the Bible* (1901); *The Jew as a Patriot* (1902); and several devotional books.

PETERS, Phillis. The name, after marriage, of the colored poet Phillis Wheatley (q.v.).

PETERS, Richard (1744-1828). An American jurist, born in Belmont, Pa. (now part of Philadelphia). He graduated at Philadelphia College (now University of Philadelphia) in 1761, studied law, and soon rose to eminence at the bar. During the Revolutionary War he was captain of a militia company in 1775-76, was secretary of the Board of War from 1776 to 1781, and was instrumental in having Benedict Arnold tried before a court-martial in January, 1780. He was a member of Congress in 1782-83, sat in the State Assembly in 1787-91, and was a United States district judge from 1792 to 1828. He was one of the founders of the Philadelphia Agricultural Society and its president for more than thirty years, wrote many valuable papers on agricultural subjects, and in 1797 demonstrated by a series of experiments the agricultural value of gypsum. He published *Admiralty Decisions in the United States District Court of Pennsylvania* (2 vols., 1807). His son, Richard Peters, Jr. (1780-1848), was successor of Henry Wheaton as reporter of the United States Superior Court, and published *Reports of the United States Circuit Court, 1803-18* (1819); *Reports of the United States Supreme Court, 1828-43* (17 vols., 1828-43); *Condensed Reports of Cases in the United States Supreme Court from Its Organization till 1827* (6 vols., 1835); and *Case of the Cherokee Nation Against the State of Georgia*. He was also editor of *Chitty on Bills;* Bushrod Washington's *Circuit Court Reports, Third Circuit* (4 vols., 1803-27); and of the *United States Statutes at Large*.

PETERS, Samuel (1735-1826). An American clergyman, the author of a well-known history of Connecticut. He was born in Hebron, Conn., graduated at Yale in 1757, and in 1759 was ordained in London as a minister of the Church of England. Returning to Connecticut in 1760, he was placed in charge of the churches of Hebron and Hartford. In the pre-Revolutionary controversies he embraced the Tory cause, and was so pronounced in his loyalty to the Crown that in 1774 he was forced by the 'Sons of Liberty' to abandon the colony and take refuge in England. Here in 1781 he published anonymously his celebrated *General History of Connecticut, from Its First Settlement Under General Fenwyck, Esq., to Its Latest Period of Amity with Great Britain* (republished in New York, 1877), in which he gave a code of so-called 'blue laws' which attracted widespread attention. These laws were formerly supposed to have been pure forgeries and fabrications, but recent investigations have shown them to have been taken in part from an earlier writer (Neal) and in part (with modifications) from actual laws, only two or three of the forty-five having been apparently invented out of hand. In 1805 Peters came to New York. In 1817 he visited the Falls of Saint Anthony, taking up a large claim there, but again settled in New York (1818) and died there in great poverty eight years later. He published a number of books and pamphlets, characterized by a slovenly and uncritical scholarship, and by a general uniformity of misstatement and reckless assertion. Consult: Trumbull, *The Rev. Samuel Peters, His Defenders and Apologists* (Hartford, 1877); id., *The True Blue Laws of Connecticut and New*

Haven (Hartford, 1876); and "Examination of Peters's Blue Laws," by Prince, in *Annual Report of the American Historical Association* for 1898.

PE'TERSBURG. A city and the county-seat of Menard County, Ill., 20 miles northwest of Springfield; on the Sangamon River, and at the junction of the Chicago, Peoria and Saint Louis and the Chicago and Alton railroads (Map: Illinois, C 4). It is surrounded by a farming and stock-raising district, having deposits of coal. There are several coal mines and various manufactories, including flouring mills, a canning factory, brick and tile plant, etc. Population, in 1890, 2342; in 1900, 2807.

PETERSBURG. A town and the county-seat of Pike County, Ind., 44 miles north by east of Evansville; on the Evansville and Terre Haute Railroad (Map: Indiana, B 1). It has manufactures of flour, brick and tile, lumber, etc., and considerable trade in coal, which is mined extensively in the vicinity. Agriculture and stock-raising also are important industries in the fertile region adjacent. Natural gas is found here. Population, in 1890, 1494; in 1900, 1751.

PETERSBURG. A city, independent of county authority, at the junction of Chesterfield, Dinwiddie, and Prince George counties, Va., 22 miles south of Richmond, on the Appomattox River and the upper Appomattox Canal, and on the Norfolk & Western, the Atlantic Coast Line, and the Seaboard Air Line railroads (Map: Virginia, G 4). There are two steel bridges across the river, and two public parks. Petersburg is the seat of the State Central Hospital for the Insane, with 1000 colored patients; the Virginia Normal and Collegiate Institute, for the higher education of colored students of both sexes; Southern Female College; and the University School for young men. It has a Benevolent Mechanics' Association, with a library and museum. There are also the Young Men's Christian Association; the Home for the Sick; and fine Masonic, Odd Fellows', and Red Men's buildings. Petersburg carries on an extensive trade in tobacco, and is an important industrial centre, its manufacturing interests being promoted by excellent water power. The products of the principal industries are cotton, tobacco, machinery, trunks, clothing, silk and knit goods. Under a charter of 1875, the government is vested in a mayor, elected every two years, and a council which controls elections of all officials governing the administrative departments. The water works are owned and operated by the municipality. Population, in 1890, 22,680; in 1900, 21,810.

Petersburg was founded in 1733 on the site of an Appomattox Indian village destroyed in 1676 by Nathaniel Bacon; was incorporated as a town in 1748, and was chartered as a city in 1850. During the Revolution it was twice occupied by the British under General Philips, and in the War of 1812 the Petersburg volunteers served with conspicuous gallantry. Being a great railway centre of supply from the south, Petersburg was the scene of much of the fighting in the famous Virginia campaign of 1864-65. (See CIVIL WAR.) After his disastrous failure at Cold Harbor June 3, 1864 (q.v.), Grant marched his army of more than 100,000 men to the James River, with the idea in part of taking Petersburg and thus of forcing the evacuation of Richmond. General Butler, at Bermuda Hundred, was hastily reinforced by a corps under General W. F. Smith, and was ordered to attack Petersburg, then defended by only 2500 Confederates. But though his force numbered 16,000, he carried out his orders (June 15th) half-heartedly and inefficiently and thus allowed Confederate reinforcements to be thrown into the city. Grant, arriving on June 16th, made bloody but unsuccessful assaults on the 16th, 17th, and 18th, his losses for the three days being fully 10,000. He then settled down for a siege. On July 30th the famous Petersburg mine—a shaft 520 feet long with lateral branches (near the end) extending 40 feet on each side—was exploded with terrific effect, a Confederate regiment being destroyed and a huge crater produced, through which an inefficiently commanded force of Federals tried to fight its way. The Confederates quickly recovered, poured a deadly artillery fire into the crater, and the Federals were forced back with a loss of more than 4000. Lee repeatedly foiled the manœuvres of Grant, but finally, on April 2, 1865, after the disaster at Five Forks, was compelled to evacuate both Petersburg and Richmond. Consult Humphrey, *The Virginia Campaign of 1864 and 1865* (New York, 1883).

PETER SCHLEMIHL, pā'tĕr shlā-mēl'. A widely popular tale by Chamisso (1813), relating the adventures of a man who sells his shadow to the Evil One in return for an inexhaustible magic purse. His wealth, however, does not save him from the suspicion and horror with which his fellows regard his strange condition. He is unwilling to buy back his shadow at the stipulated price, his soul, and in despair throws away the purse, buying with his last money a pair of seven-league boots. With these he traverses the whole earth and by his study and knowledge of the world at last gains contentment.

PETERSEN, pā'tĕr-sen, EUGEN (1836—). A German archæologist, born at Heiligenhafen, in Holstein. He studied at Kiel and Bonn, in 1873 was appointed professor of archæology at Dorpat, and in 1879 at Prague. He was a member of the Austrian archæological expeditions to Greece in 1880 and to Asia Minor in 1882-85. In 1886, after removing to Berlin, Petersen was sent to Athens as secretary of the German Archæological School, and in 1887 was transferred to a corresponding post in the German School at Rome. He edited Theophrastus's *Characters* (1859), and wrote: *Die Kunst des Pheidias am Parthenon und zu Olympia* (1873); *Reisen in Lykien* (with others, 1889); *Studie Pamphylicus und Pisidiens* (with Niemann and Count Lanckoronski, 1890-92); *Vom alten Rom* (1898; 2d ed. 1900); and *Trajans dakische Kriege nach Säulenrelief* (1899 sqq.).

PETERSEN, JOHANN WILHELM (1649-1727). A Lutheran mystic. He was born at Osnabrück, taught at Rostock and Giessen, and preached acceptably at Hanover. In 1678 he became superintendent of Lübeck. Ten years later he was chosen to a similar position at Lüneburg, but his millenarian views led to his summary removal and banishment in 1692. He went to Magdeburg and spent the rest of his life preparing pamphlets and treatises explaining and defending his views. Petersen was the leading Lutheran mystic and premillenarian of the seventeenth century. He was entirely orthodox and conventional except

upon various points, such as the thousand years' reign of Christ upon earth and the apokatastasis or doctrine of universal restoration. Petersen wrote his autobiography, *Lebensbeschreibung* (2d ed., Frankfort, 1719). One of his treatises, *Die Stimme aus Zion*, appeared in Ebenezer, N. Y. (1851-52).

PETERSEN, NIELS MATTHIAS (1791-1862). A Danish scholar and historian of literature, born at Sandown, on the island of Fünen. He was appointed professor in the Normal School of Brahetrolleborg, was employed in the State archives, and in 1845 was chosen professor of Scandinavian languages in the University of Copenhagen. Petersen wrote on mythology, history, geography, and above all literary history. His most important works are *Bidrag til den old Nordiske Literaturs Historie* (1866), and *Bidrag til den Danske Literaturs Historie* (1853-64; 2d ed. 1867-71), a valuable work which stops with the beginning of the nineteenth century.

PETER SIMPLE. A novel by Captain Marryat (1834). This rollicking sea-tale gives the adventures of a clergyman's son, a midshipman on a man-of-war. He cruises in the Mediterranean and the West Indies. A scheming uncle tries to injure him, finally consigning him to an insane asylum. But he escapes and succeeds his grandfather as Lord Privilege.

PE'TERSON, FREDERICK (1859—). An American neurologist and alienist, born at Faribault, Minnesota. In 1879 he was graduated from the medical department of the University of Buffalo. After several years in Europe, he became, in 1882, professor of general pathology and director of the laboratory of the University of Buffalo. In 1888 he established himself in New York City as a specialist in nervous and mental troubles. In 1893-94 he was professor of neurology at the University of Vermont. For several years he was professor of neurology in the Women's Medical College, pathologist in the New York City Insane Asylum, and attending physician to the New York Hospital for Nervous Diseases and to the St. Saviour's Sanatorium for Inebriate Women. He also became chief of clinic in the Department of Nervous Diseases of the College of Physicians and Surgeons of Columbia University, New York City. He became president of the New York State Commission in Lunacy in 1900. Dr. Peterson is one of the editors of the *New York Medical Journal* and the *Journal of Mental and Nervous Diseases*. For many years he was an editor of the *American Medico-Surgical Bulletin*. Besides monographs, he has written a book on *Mental Diseases* (1899), which is a part of Church and Peterson's *Nervous and Mental Diseases* (1899).

PETER'S PENCE. The name given to offerings made for the support of the Pope. As a definite historical tribute, it seems to have had its origin in England, from which it spread to Denmark and Norway under Canute. The origin of the payment has been attributed to Ina, King of the West Saxons, and by others to Offa and to Ethelwulf; but the question is still obscure; Lingard is disposed not to trace it further back than the time of Alfred. It was collected annually in the month of July, or between the feasts of Saints Peter and Paul and of Saint Peter's chains. It consisted in the payment of a silver penny by every family that possessed land or cattle of the yearly value of thirty pence. The payment was finally abolished under Henry VIII. Latterly the name has been often applied to the voluntary offerings for the support of the Holy See made by its subjects in all parts of the world, since the loss of its territorial possessions has made other support necessary.

PETERSSEN, pā'tĕr-sen, EILIF (1852—). A Norwegian painter, born in Christiania. He was a pupil of Riefstahl and Descoudres at Karlsruhe and of Dietz in Munich. He first painted costume pictures, such as "Christian II. Signing a Death Warrant" (1876, Breslau Museum); then religious subjects, in which he was influenced by the Venetians, whom he studied in Italy; and finally genre and landscapes. "The Laundresses" (1889) and "Woodland Lake" (1891) are examples of his fine and harmonious color, in the genre in which he is most successful. The Museum at Christiania contains a "Siesta," and the New Pinakothek at Munich a "Summer Night in Norway."

PETERWARDEIN, pā'tĕr-vär-dīn' (Hung. *Péterrárad*). A free town and strong fortress of Croatia and Slavonia, Hungary, situated on a promontory on the right bank of the Danube opposite Neusatz, with which town it is connected by two bridges (Map: Austria, G 4). The fortifications consist of the old fortress on the lofty rock and the lower fortress at its base. Population, in 1900, 5019. Peterwardein is believed to occupy the site of the Roman *Acumincum*. The fortress was captured by the Turks in 1526 and was the scene of the defeat of the Grand Vizier Ali by Prince Eugene in 1716, after which it was awarded to the Emperor by the Peace of Passarowitz in 1718.

PET'IGRU, JAMES LOUIS (1789-1863). An American jurist, born in Abbeville District, S. C. He graduated at the College of South Carolina in 1809, and taught until his admission to the bar in 1812. He began practice in this district, volunteered for the defense of Port Royal against a threatened British attack in 1813, and soon afterwards was elected solicitor of the district. In 1819 he accepted an advantageous partnership in Charleston, and was elected Attorney-General of the State in 1822. When the issue of nullification (q.v.) was presented he was prominent in the Union Party, and resigned his office in 1830 to become a candidate for the State Senate. He was defeated, and incurred much unpopularity. From 1850 to 1853 he was United States District Attorney, and later was selected to codify the laws of South Carolina, which task was finished in 1862. He vigorously opposed secession, but preserved the respect of his fellow citizens. His bust was placed in the City Hall of Charleston in 1883. Consult Grayson, *James Louis Petigru* (New York, 1866).

PETIOLE (from Lat. *petiolus*, stalk or stem of fruits, irregular diminutive of *pes*, foot). The stalk-like portion of a leaf (q.v.).

PÉTION, pā'tyôN', ALEXANDRE SABES (1770-1818). A Haitian general and politician, born at Port-au-Prince, April 2, 1770, the son of a white father and a mulatto mother. He received a good education and fought for his country's independence under Toussaint L'Ouverture. Later he joined General Rigaud against L'Ouverture, went to France in 1800, and returned in 1802 with General Leclerc. He subsequently served under

Dessalines (q.v.) against the French. Upon the death of Dessalines and the succession of Christophe (q.v.) the southern part of the island set up an independent republic and Pétion, who was Governor of Port-au-Prince, was chosen President in 1807. There followed a civil war with Christophe, which desolated the country for many years. Pétion remained at the head of the Government in the southern part of the island until his death. While in power Pétion displayed an amount of moderation strange in a Haitian politician. He protected the foreigners in the country and made some attempts to preserve the national credit. A sketch of his military and political career is given in St. John's *Hayti; or, The Black Republic* (London, 1884).

PÉTION DE VILLENEUVE, *de vél'nëv'*, JÉRÔME (1756-94). A French revolutionist. He was the son of a procurator at Chartres, and was practicing as an advocate in his native city when he was elected in 1789 a Deputy to the States-General. He became a prominent member of the Jacobin Club, and an ally of Robespierre. He was sent as one of three commissioners to bring back the royal family from Varennes after their attempted flight, and in the execution of this commission he acted in a harsh and unfeeling manner. In November, 1791, he was elected Mayor of Paris to replace Bailly. He became a member of the Convention, and on September 20, 1792, its first president. He favored the Girondists, and although at the trial of the King he voted for his death, he was suspected of being a Royalist, and of complicity in the treason of Dumouriez. He was thrown into prison, June 2, 1793, on the fall of the Gironde, but escaped and joined the other Girondists at Caen. In company with Buzot he reached the neighborhood of Bordeaux. A short time after, their dead bodies were found in a field near Saint Emilion, and they were supposed to have committed suicide. The public career of Pétion shows him to have been weak, shallow, ostentatious, and vain. The *Œuvres de Pétion*, containing his speeches and some small political treatises, were published at Paris, in 4 vols. (1793). Consult also *Mémoires inédites*, edited by Dauban (Paris, 1866), and Vatel, *Charlotte Corday et les Girondins* (ib., 1872). See FRENCH REVOLUTION.

PETIT DE JULLEVILLE, *pe-tē' de zhul'vēl'*, LOUIS (1841—). A French historian, born in Paris. From the Ecole Normale (1860-63) he went to the French School in Athens, was made doctor of letters in 1868, and, after teaching rhetoric in the Collège Stanislaus, Paris, removed to Dijon. Thence he returned to Paris, where he became professor of French mediæval literature and of the history of the French language in the Faculty of Letters (1886). Three of his works were crowned by the Academy, and besides text-books on his subject, he published *Histoire de la Grèce sous la domination romaine* (1875); *Histoire du théâtre en France: Les mystères* (1880); *Les comédiens au moyen âge* (1885); *La comédie et les mœurs en France au moyen âge* (1886); *Le théâtre en France* (1889). In 1896 he began the publication of a *Histoire de la langue et de la littérature française*, in eight volumes.

PETITION (Lat. *petitio*, from *petere*, to seek; connected with Gk. *πίτνᾱσθαι, pitnasthai*, Skt. *pat*, to fly). A supplication preferred to one capable of granting it. The right of a British subject to petition the sovereign or either House of Parliament for redress of grievances is a fundamental principle of the English Constitution and has been exercised from very early times. The right was so generally exercised in the time of Edward I. and Edward II. that it became necessary to formulate rules and methods by which the task of hearing petitions could be facilitated. Those which could not be answered without special reference to the King formed a special branch of business, and it was from the share of the Chancellor in examining and reporting on petitions for clemency and favor that his equitable jurisdiction grew up in the fourteenth century. The nomination of 'receivers' and 'triers' of petitions became a part of the opening business of every Parliament, and proclamation was made inviting all persons to resort to the receivers. The receivers were clerks or masters in chancery; the triers were selected by the King from the Lords, spiritual and temporal, and from the justices. The triers could call to their assistance the Chancellor, Treasurer, Steward, and Chamberlain. After examining into the nature of the grievances for which redress was sought, they referred the petitions to certain of the courts or to Parliament for further action.

In the time of Richard II. the work of receiving and hearing petitions was divided into three parts; one part for the consideration of the King, one for the Council, and one for Parliament. The increasing power of the Commons over taxes and expenditures vastly augmented the importance of the right of petition to the Crown. In the fourteenth century they began the policy of accompanying their grants with petitions for redress in the name of the whole community. Later the petition for redress preceded the grant, and the latter was made conditional upon the promise of the King to provide the desired relief.

Since the revolution of 1688 the practice has been gradually introduced of petitioning Parliament, not so much for the redress of specific grievances as regarding general questions of public policy. Petitions must be in proper form and respectful in language; and there are cases where petitions to the House of Commons will only be received if recommended by the Crown. A petition must, in ordinary cases, be presented by a member of the House to which it is addressed; but petitions from the Corporation of London may be presented by the sheriffs or Lord Mayor. Petitions from the Corporation of Dublin have also been allowed to be presented by the Lord Mayor of that city.

The practice of the House of Lords is to allow a petition to be made the subject of a debate when it is presented; and unless a debate has arisen on it, no public record is kept of its substance, or the parties by whom it is signed. In the House of Commons petitions not relating to matters of urgency are referred to the Committee on Public Petitions, and in certain cases ordered to be printed.

The Constitution of the United States, like that of Great Britain, guarantees to every citizen the right of petition for a redress of grievances.

This constitutional right was practically nullified once in our history by the action of the National House of Representatives in the case of those petitions which related to the abolition of negro slavery. This was the so-called 'gag' resolution of January, 1840, which pro-

[illegible] anti-slavery petition should be re- [illegible] and by the House of Representatives.

PETITION AND ADVICE, THE HUMBLE. A written constitution of England during the Protectorate. The first Parliament elected according to the Instrument of Government (q.v.) was dissolved because it assumed the function of altering the Constitution under which it was called. A second Parliament was summoned by Cromwell, who was in urgent need of money, to meet on September 17, 1656, but nearly one hundred of its members had to be excluded as hostile to the Protector's Government. After this purge the assembly was ready to carry out Cromwell's wishes, asked him to take the title of King, and laid before him for approval a 'Humble Petition and Advice.' This may be regarded as practically an amended constitution, although it did not entirely supersede the Instrument of Government. The Protector declined the royal title, but after some alteration the Humble Petition and Advice was passed, and received his assent on May 25, 1657. On the 26th of the following month it was somewhat modified by the 'Additional Petition and Advice,' designed mainly to explain certain doubts and questions which had arisen. As a result of the two instruments the powers of the Council of State were lessened and those of the Parliament were increased. Henceforth the latter was to consist of two Houses, and the Protector was not again to exclude from sitting therein those who had been legally elected. As some compensation for this loss of authority, he was allowed to appoint his successor and to nominate the life members of 'the other House,' which was substituted for the House of Lords. The text of the Petition is contained in Gardiner, *Constitutional Documents* (Oxford, 1889), and Scobell, *Acts and Ordinances* (London, 1658). Consult also: Masson, *Life of Milton* (ib., 1873-94); Lingard, *History of England*, vol. viii. (ib., 1883). See CROMWELL, OLIVER.

PETITION OF RIGHTS. A declaration of certain rights and privileges of the subject obtained from King Charles I. in his third Parliament (1628). It was so called because the Commons stated their grievances in the form of a petition, refusing to grant the supplies till its prayer was heard. The petition is supposed to be a mere corroboration and explanation of the ancient Constitution of the kingdom; and after reciting various statutes, recognizing the rights contended for, prays "that no man be compelled to make or yield any gift, loan, benevolence, tax, or such like charge, without common consent by act of Parliament; that none be called upon to make answer for refusal so to do; that freemen be imprisoned or detained only by the law of the land, or by due process of law, and not by the King's special command, without any charge; that persons be not compelled to receive soldiers and mariners into their houses against the laws and customs of the realm; that commissions for proceeding by martial law be revoked." The King at first eluded the petition, expressing in general terms his wish that right should be done according to the laws, and that his subjects should have no reason to complain of wrongs or oppressions; but at this reply the Commons expressed dissatisfaction and prepared a remonstrance against the advisers of the King. The King thereupon ordered them not to meddle with affairs of State. The Commons then took up the charges against Buckingham, when the King yielded to their demands and gave his assent to the petition, June 7, 1628.

PETITIO PRINCIPII, pē-tĭsh'ĭ-ō prĭn-sĭp'ĭ-ī (Lat., begging of the question). The name given in logic to that species of vicious reasoning in which the proposition to be proved is assumed in the premises of the syllogism.

PETIT JOURNAL, pe-tē' zhōōr'nâl', LE. A daily paper, founded at Paris in 1863, republican in politics. Its low price commands for it an immense circulation throughout the country as well as in Paris.

PETITOT, pe-tē'tō', JEAN (1607-91). A French painter in enamel, born in Geneva. He learned the jeweler's trade and early began to use enamel in connection with his work. About 1634 he went to England and there met Van Dyke, who introduced him to the notice of Charles I. He had apartments in Whitehall and made various portraits of the King and his Court. One of the Duchess of Southampton (1642), in the collection of the Duke of Devonshire, is called his masterpiece. After the King's death he went with the royal family to Paris, where he enjoyed the favor and patronage of Louis XIV. He lived in the Louvre and painted the King, Anne of Austria, Madame de Maintenon, La Vallière, and others of the time. These are included in the collection of his works in the Gallery of Apollo, in the Louvre. They are done with great delicacy and particularly harmonious color. The Revocation of the Edict of Nantes in 1685 sent him back to Geneva, despite the fact that Louis had Bossuet himself try to convert him. He died in Vevey. His works are scarce and of high value.

PETIT-QUEVILLY, pe-tē' ke-vē'yē'. A town of France in the Department of Seine-Inférieure, situated two miles southwest of Rouen. Its principal industries are cotton and linen spinning and the manufacture of shoes, chemicals, starch, and soap. Population, in 1901, 13,948.

PETIT-THOUARS, tōō'ār'. ABEL AUBERT DU. See DUPETIT THOUARS, ABEL AUBERT.

PE'TO, Sir SAMUEL MORTON (1809-89). An English contractor and politician, born in Woking, Surrey. He was apprenticed to his uncle, a builder, at whose death in 1830 he and his cousin, Thomas Grissell, inherited the business and established the firm of Grissell and Peto. They secured a number of important contracts, among them those for the Conservative and other club-houses, several London theatres, the Nelson Column, the Houses of Parliament, and a large part of the Great Western and the Southeastern railroads. In 1846 they dissolved their partnership, Grissell taking the building and Peto the railroad contracts. The same year Peto took Edward L. Betts into partnership with him, and the new firm secured contracts for railroads in England, France, Norway, Denmark, Russia, Canada, and Australia. During the Crimean War Peto constructed a railroad between Balaclava and the intrenchments, which proved of great service and for which he was created a baronet in 1855. He served several terms in Parliament, but in 1868 was obliged to resign because of the failure of his firm during the financial panic of 1866. Consult *Sir Morton Peto, a Memorial Sketch* (1893).

PETÖFI, pĕ'tē-fī, SÁNDOR (ALEXANDER) (1822-49). The national poet of Hungary, born

at Kis-Körös, in the County of Pesth, December 31, 1822. His father was a butcher and a small landowner in Little Cumania, and bore the name of Petrovics—a name indicating a Slavic origin. In 1838 his father was impoverished by an overflow of the Danube, which destroyed his little estate; and it was only by the help of kinsmen that he was able to rear his son for a profession. Petöfi was sent to the lyceum of the town of Schemnitz. He ran away with a band of German strollers, and again from school at Oedenburg, this time enlisting as a common soldier. After two years in the army, a physician brought about his discharge, and he went home. He afterwards went to Pápa, to complete his education. In 1842 he left Pápa to join a troop of comedians, but he soon parted from them. He made his way to Pressburg, and afterwards to Pesth, where he got some employment as a translator from the English and the French. Going to Debreczin, he made another venture as an actor, playing the part of Othello, but again failed. At last he had the good fortune to be invited to contribute to a newspaper at Pesth. On his arrival at that city he exchanged the name of Petrovics for Petöfi, and it was not long before he became famous as a lyric poet.

Petöfi introduced himself to Vörösmarty, then the poet of Hungary, who received the shabby stranger coldly, but when he had listened to his verses he exclaimed, "Hungary never had such lyrics; you must be cared for." And from that time he treated Petöfi as a son. Petöfi was almost at once received into the literary national circle, at the expense of which was published his *Versek*, which appeared in 1844. This was rapidly followed by other volumes, which won boundless popularity. In March, 1848, he was the leader in the first movement of the Hungarian revolution at Pesth, and he became, by speech and pen, the advocate of the independence of Hungary. His poem, *Talpra, Magyar!* (Up, Magyars!), like later stirring lyrics, excited great patriotic enthusiasm. He enlisted in the National Army, and in the beginning of 1849 he was appointed adjutant and secretary to General Bem. Petöfi was at the battle of Schässburg (Segesvár), fought on July 31, 1849, in which Bem's army was overwhelmed. He was never heard of after that day. It is believed that he was killed by a Cossack in the flight, and that his body, so mangled as to escape recognition, was buried with the multitude of Magyar dead left upon the field. His countrymen at first believed that he was not dead, but a prisoner in an Austrian dungeon. In 1877 a rumor gained currency that Petöfi was still living as a Russian prisoner in one of the mines of Siberia, and the Austrian Government was forced by public opinion to institute official inquiries in order to prove the groundlessness of the report. On October 15, 1882, a monument to the poet was unveiled in Petöfi Square at Budapest, and the house in which he was born at Kis-Körös was purchased with the intent to preserve it. He left a widow and one son.

Petöfi is the greatest literary genius of Hungary, and he ranks, by common critical consent, among the greatest lyric poets of the last century. The most beautiful of his poems are his impassioned shorter lyrics, of which he published several collections, under the titles *Cypress Leaves on Etelka's Grave; Pearls of Love; Starless Nights; Clouds.* The most celebrated of his narrative poems—also the longest—are: *Janos, the Hero; Istok, the Fool.* His earliest work was *The Wine-Drinkers*, published in 1842; his latest, *The Assessor of the Judgment-Seat*, which appeared in 1849. Petöfi translated Shakespeare's *Coriolanus* in 1848. A volume, containing a poem entitled *The Apostle*, was suppressed by the Austrian Government after the pacification of Hungary. Petöfi published a novel, *The Hangman's Rope*, which failed, like his play *Tigr and Hyena*, and he wrote several volumes of tales, criticisms, and sketches of travel; he also translated largely from English and French into Magyar.

A selection from his earlier pieces, translated into German, was published in 1845; and several volumes of translations from his writings have since appeared in Germany. His poems have also been translated, in part, into French, Flemish, Polish, Danish, and Italian; and an English version, comprising his finest poems, was published in London in 1866 by Sir John Bowring. A critical edition of his works is in preparation by A. Haras, who has already published a number of volumes. Consult: Fischer, *Petofis Leben und Werke* (Leipzig, 1889); Bubenik, *A. Petofi, eine Skizze seines Lebens und Dichtens* (Vienna, 1882); and the biographies in Magyar by Zilahy (Pest, 1864) and A. Vutkovics (Pressburg, 1883).

PETOS'KEY. A city in Emmet County, Mich., 43 miles southwest of Cheboygan; on Little Traverse Bay, an arm of Lake Michigan, and on the Grand Rapids and Indiana and the Pere Marquette railroads (Map: Michigan, H 3). Steamers ply to several of the important lake ports. Petoskey is an attractive summer resort, and has a public library and the Petoskey Normal School. There are iron works, a foundry and machine shops, lime kilns, lumber and flour mills, a leather factory, rug and carpet factory, etc. The water-works and electric light plant are owned by the municipality. Petoskey was incorporated as a village in 1878 and in 1896 became a city. Population, in 1890, 2872; in 1900, 5285.

PE'TRA (Lat., from Gk. *πέτρα*, rock). An ancient city of Northern Arabia, in the 'desert of Edom,' about 70 miles northeast of Akabah (Map: Turkey in Asia, F 7). It occupied a narrow rocky valley, overhung by mountains, the highest and best known being Mount Hor, directly to the west. Petra owes its name to its peculiar character as a 'rock-city,' which also gave it the Hebrew name, *Sela'*, 'rock' (II. Kings xiv. 7; Is. xvi. 1). Its importance was due to its location on the great highway from the Red Sea and Arabia northward, while its situation protected it from Bedouin raids. It thus became an important centre of trade. In the ninth century B.C. it was captured by King Amaziah of Judah, who changed the name to Joktheel, according to II. Kings xiv. 7. In the second or third century B.C. it fell into the hands of the Nabateans (q.v.). From the time of Pompey it was tributary to the Romans. In 105 Trajan made a province of Arabia Petræa (the name being taken from the city) and Hadrian granted certain privileges to the town. Christianity was introduced at an early period and Petra became the seat of a bishop. In the fourth or fifth century trade began to follow other channels and the importance

[illegible] the Mohammedan conquest [illegible] unknown to Europeans [illegible] the nineteenth century, when it was [illegible] Seetzen and Burckhardt. Since then the remarkable remains of Petra have become well known. They stand in a small open irregular basin, about half a mile square, through which runs a brook, and are best approached by an extraordinary chasm or ravine called the *Sik* (or Wady Musa), narrowing as it proceeds till in some places the width is only 12 feet, while the rocky walls of red sandstone tower to the height of 80 to 200 feet. Hardly a ray of sunlight can pierce this gloomy gorge, yet it was once the highway to Petra, and the remains of an ancient pavement can be traced beneath the brilliant oleanders that now cover the pathway. All along the face of the rocky walls are rows of cave tombs, hewn out of the solid stone, and ornamented with façades. These are also numerous elsewhere in and about the city. The principal ruins are: (1) *El-Khazneh* ('the treasure house'), believed by the natives to contain, buried somewhere in its sacred inclosure, the treasures of Pharaoh; it directly faces the mouth of the gorge of Wady Musa and was probably the great temple of the Petreans; (2) the amphitheatre, capable of containing from 3000 to 4000 spectators; (3) certain remarkable tombs; (4) the *Dair* or convent, a huge monolithic temple, hewn out of the side of a cliff and facing Mount Hor; (5) the citadel; (6) *Kasr Fir'aun*, or Pharaoh's palace, the best preserved ruin of Petra, east of which are the remains of a triumphal arch. Most of the architecture is Greek of the third or fourth century, but forms of native art are intermixed, and there are also traces of Egyptian influence, pyramidal forms being not unknown. Consult: Laborde and Linant, *Voyage dans l'Arabie Pétrée* (Paris, 1830); De Luynes, *Voyage aux bords de la Mer Morte, Petra*, etc. (ib., 1875); Palmer, *The Desert of the Exodus* (Cambridge, 1871); Visconti, *Diario di un viaggio in Arabia Petrea* (Rome, 1872).

PETRARCH (It. **PETRARCA**, pā-trär'kä), Francesco (1304-74). An Italian poet and humanist, born at Arezzo, July 20, 1304, of a family then in exile from Florence, because of its affiliation with the party of the Bianchi. Francesco changed his father's name Petracco to Petrarca. The wanderings of the family took the lad to Pisa in 1310 and in 1313 to Avignon in France. After some preliminary training he was sent to Montpellier in 1319 to study law. After some four years there he went to Bologna unwillingly to continue his studies in jurisprudence, for he shrank from pettifogging, though he admired the majesty of Roman law. He had an unbounded love for classical lore, and to this he devoted himself after the death of his father (1326), who had once flung his son's books of poetry and rhetoric into the flames, allowing the half-burnt manuscripts to be rescued at Francesco's passionate entreaty. In 1326 he returned to Avignon and took minor orders as an ecclesiastic. Thus he was not bound by the stricter laws of ecclesiastical discipline, and yet he could enjoy the numerous religious benefices accorded to him. It may be said here that Petrarch was no skeptic like Boccaccio and that his piety was of a worthy kind. He entered into the gay and fashionable life of Avignon, and there he met in 1327 that Laura who was to inspire his imperishable lyrics. The historical reality of this personage has often been doubted. On the other hand, many endeavors have been made to identify her with this or that woman. The only probable identification seems to be that with Laura de Noves, wife of Hughes de Sade and mother of eleven children at the time of her death by the plague of 1348. However unpoetical the circumstances of her life may have been, she aroused in the poet that spirit of devotion which stirred him in the composition of sweeter lyric verse than had yet been heard in Italy.

Yielding to his nomadic impulses, Petrarch roved about for a while, traveling through Southern France and Germany in 1333, and entering Rome for the first time in 1337. In 1337, eleven years before Laura's death, some unknown woman bore Petrarch a son, Giovanni, and probably it was she who gave him a daughter Francesca in 1343. These children were legitimized by Papal bulls. At intervals he was back again in Avignon, and thence he withdrew for a while to the solitude of Vaucluse (Valchiusa). It was here that he received in 1340 from the universities of Paris and of Rome invitations to visit those places and receive the crown of the poet laureate. He decided in favor of the University of Rome, and on Easter Sunday, 1341, he was publicly crowned on the Capitol. He now visited many Italian cities and in 1343 was sent by Pope Clement VI. on an embassy from Avignon to Naples. Resuming his rambles about Italy, he had the good fortune to discover some of the letters of Cicero, just as he had earlier brought to light two of Cicero's orations. He may also have found a part of the *Institutiones* of Quintilian. At Parma he got tidings in 1348 of Laura; in 1350 he was in Florence with Boccaccio, and in 1351 Boccaccio visited him at Padua. Having refused several offers of apostolic secretaryships from the Holy See, he left Avignon for good in 1353. About this time began his connection with the Visconti in Milan, who in 1356 sent him to Prague as ambassador to Charles IV. of Germany, and in 1360 he undertook a similar mission to Paris. The remaining years of his life were mainly spent in scholarly pursuits at Arqua, near Padua, and there he died July 18, 1374.

Petrarch wrote much more in Latin than in Italian, and prided himself more on his Latin writings than on those in Italian. His works in Latin consist chiefly of a poem in hexameters, the *Africa*, dealing with the undertakings of Scipio Africanus, and of moral, historical, and other scientific treatises, as well as of letters. All his Latin compositions are now forgotten, yet mention may be made of the *Carmen Bucolicum* and the *Epistolæ Metricæ*, which contain many allusions to events of his time and life, as do also his *Letters*, for which reference may be made to Voigt, "Die Briefsammlungen Petrarkas," in the *Abhandlungen der historischen Classe der bayerischen Akademie der Wissenschaften*, vol. xiii. (Munich, 1883). Petrarch's Latin shows the influence of Seneca and of his beloved Saint Augustine, rather than of the best classics. Indeed, Petrarch still belongs to the mediæval school, and it remained for a Poliziano and a Bembo to prepare the way for an Erasmus. The *Canzoniere*, containing his Italian verse, is the work for which Petrarch is now remembered. It comprises sonnets, *canzoni*, *sestine*, *ballate*, and madrigals, mainly of an amorous nature, and de-

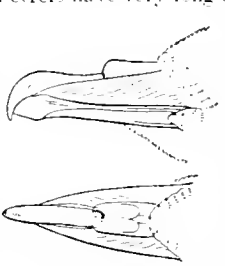
PETRARCH

FROM AN ENGRAVING [illegible]

voted to an account of his love for Laura, although some deal with political and other subjects. On the formal side Petrarch shows a considerable advance over his forerunners, whose methods he developed. As to the love that he sang, it can hardly be doubted that its object was a single and concrete one, even though the description of the passion often takes a highly symbolized and idealized form. Certainly Laura is not a woman, but woman in general. She has no strongly individualized traits. She is rather the noblest abstraction of fair womanhood to be found in literature between Dante's Beatrice and the period when poets began to sing of women undeniably flesh and blood. In the minute psychological examination of his own sentiments Petrarch shows some knowledge of the human heart, but, after all, his sonnets lack striking individuality. What one notices most is the poet's astounding ability to vary a few lovely or noble themes. In his pictures of natural scenery he displays an observation of the external phenomena of the world not to be found in other writers of his time. Yet Petrarch's descriptions of the beauties of Valchiusa might fit many another place as well. Valchiusa is not more individualized than Madonna Laura. The *Trionfi*, published with the other Italian verse of the *Canzoniere*, are an imitation of the allegorical vision of Dante. The vogue of the lyrics of Petrarch became enormous almost at once after the appearance of the first edition of the *Canzoniere* (Venice, 1470). It continued for many generations and spread abroad. Thus a very marked influence of his poetical methods is to be noted in Spanish verse of the sixteenth and seventeenth centuries. As a humanist, Petrarch went far to revive the study of Greek literature, although he was himself ignorant of the language; he was most successful, however, in the impulse which he gave to the study of Latin letters. As a writer of Italian, he shows in his style a degree of precision and refinement which indicates an improvement upon the art of Dante. But his style is marked by artificiality and many conceits such as we find in the troubadours.

Consult the edition of Petrarch's Latin and Italian works, published at Basel in 1554; also a critical edition of the *Africa* by Corradini (Padua, 1874, with an Italian translation by Gaudo, Oneglia, 1874); the *Poemata Minora* (Milan, 1829-34); the editions of the *Canzoniere* by Mestica (Florence, 1895), and by Carducci and Ferrari (Florence, 1899); the editions by Fracassetti (Florence, 1859-63) of the *Epistolæ de Rebus Familiaribus et Variæ*, published in Italian as the *Lettere di Francesco Petrarca (familiari e varie) volgarizzate e dichiarate* (Florence, 1863-67), and *Lettere scelti, etc.* (ib., 1869-70); Marsand, *Biblioteca petrarchesca* (Milan, 1826); Hortis, *Catalogo delle opere di Francesco Petrarca*, etc. (Triest, 1874); Ferrazzi, *Bibliografia petrarchesca* (Bassano, 1887); Fiske, *Catalogue of Petrarch Books* (Ithaca, N. Y., 1882); id., *Hand-List of Petrarch Editions in the Florentine Public Libraries* (Florence, 1886); Mézières, *Pétrarque*, etc. (Paris, 1867); Geiger, *Petrarca* (Leipzig, 1874); P. de Nolhac, *Pétrarque et l'humanisme* (Paris, 1892); Körting, *Petrarcas Leben und Werke* (Leipzig, 1878); D'Ovidio, "Madonna Laura," in the *Nuova Antologia* (July-August, 1888); Segre, *Petrarca e Chaucer* (ib., 1899).

PETREL (Fr. *pétrel*, from ML. **Petrellus*, diminutive of Lat. *Petrus*, Peter; so called in allusion to its walking on the sea, like the Apostle Peter). A sea-bird of the family Procellariidæ, containing several genera, and distinguished by having the bill hooked at the tip, and hard, and the nostrils united into a tube along the culmen, and the hind toe merely rudimentary. Petrels have very long and pointed wings, and the tail square or slightly forked. They possess great power of wing, and are among the most strictly oceanic of birds. Among the 70 species of the Procellariidæ are reckoned the fulmars and shearwaters (qq.v.), besides the many petrels proper, of which the stormy petrel is an example. They run along the surface of the waves in a remarkable manner, and with great rapidity—particularly when the sea is stormy and the mollusks and other animals that form their food come in abundance to the surface. From the frequency with which flocks of these birds are seen in windy weather, or as heralds of a storm, they are superstitiously regarded by sailors. They are to be seen in the seas of all parts of the world, but are more abundant in the Southern than the Northern Hemisphere.



TYPE OF PETREL BILL.

Side and top views of bill of pintado petrel (*Daption Capensis*); showing the tubular nostrils.

The names 'stormy petrel' and 'Mother Carey's chicken' are sometimes more particularly given to *Procellaria pelagica*, a bird scarcely larger than a lark, 5½ inches long, and the smallest web-footed bird known. It is sooty black in color, with a little white on the wings and near the tail. Two other species of petrel are of frequent occurrence in the North Atlantic, Leach's petrel (*Oceanodroma leucorrhoa*) and the better known Wilson's petrel (*Oceanites oceanicus*). The former may be recognized by its larger size (eight inches long) and its forked tail. It breeds among the islands in the Bay of Fundy, and in similar places in the North Pacific. The Wilson's petrel, on the other hand, is a bird of the Antarctic regions, and migrates during its winter (our summer) into the Northern Hemisphere. It is easily distinguished by its small size (seven inches long), the yellow on the webs of the feet, and the white upper tail-coverts. Besides these three species, no less than a dozen others have been recorded from the coasts or inland waters of the United States. Of these, one is a common Pacific Coast species, two others are known only from the coast of southern California, while the remaining nine are stragglers from the Southern Hemisphere. The 'cape pigeon' (*Daption Capensis*), or 'pintado,' is a very large species, well known to voyagers about the Cape of Good Hope; and in the Indian Ocean and about the shores of Australia occurs the giant of the family, the huge 'bone-breaker' (*Ossifraga gigantea*), which sailors call 'stinkpot,' and by other names referring to its vile odor. Petrels generally breed in holes and clefts of rock, or secluded coasts, and are likely to visit their nests (except when the female is sitting) only at night. Only a single egg is laid, as a rule, which is

[illegible] or with a few fine reddish dots. See Colored Plate of Eggs of American Water and Game Birds.

Consult: Evans, *Birds* (London, 1901); Baird, *Water Birds of North America* (Boston, 1884).

PETRI, pā'trē, Olaus (1493-1552). A Swedish reformer, born at Orebro, in the Province of Nerike. He studied at Upsala and the University of Leipzig, and afterwards at Wittenberg, where he continued his theological studies under Luther and Melanchthon. Upon the recommendation of King Gustavus I. he was appointed town clerk of Stockholm and at the same time preached in the cathedral, where he fearlessly expounded and urgently pleaded for the introduction of the reformed religious service. He wrote the first hymn-book in Swedish, also a Swedish chronicle (to 1520). This was published in the *Scriptores Rerum Suecicarum Medii* (1818). From 1531 to 1533 he was chancellor of the King, but his enthusiasm got him into trouble with his sovereign, and at one time seemed likely to cost him his life.—His brother, Laurentius (c. 1499-1573), was first Lutheran Archbishop of Sweden, and was born at Orebro. About 1527 he was appointed professor of theology at Upsala, and in 1531 he was elected first Lutheran Archbishop. He devoted his life to establishing the Reformed Church in this country. He drew up the first Swedish Evangelical Church order that was printed (1571), and with his brother translated the Bible into Swedish. He also wrote many theological treatises defending the principles of Church reform.

PETRIE, pē'trī, William Matthew Flinders (1853—). An English Egyptologist, born at Charlton, June 3, 1853, the son of William Petrie and Anne, daughter of Captain Matthew Flinders, the Australian explorer. He was educated at private schools, and at first turned his attention to the study of British archæology. His earliest works were *Inductive Metrology* (London, 1877), and *Stonehenge: Plans, Descriptions and Theories* (London, 1880). After 1880 he occupied himself with the investigation of Egyptian antiquities, and made many valuable discoveries. Between 1884 and 1886 he excavated the site of Tanis, Naukratis, and Daphne and revealed the existence of ancient Greek settlements at the two latter places. From 1888 to 1890 he worked in the Fayûm, finding a number of interesting funeral portraits at Hawara, and gathering an extensive collection of valuable papyri, chiefly from the ruins of Kahun and Gurob. In 1890 he discovered and excavated for the Palestine Exploration Fund the site of ancient Lachish at Tell el-Hesy, in Palestine. In 1893 he received the degree of D.C.L. from the University of Oxford and was appointed to the newly founded professorship of Egyptology at King's College, London. In 1895 he discovered the remains of a prehistoric race at Nagada, and the following year found at Thebes the stele of Meneptah, containing the sole mention of Israel occurring in the Egyptian inscriptions. After 1899 he investigated the very interesting tombs of the First Dynasty at Abdos. Among his more important works may be mentioned: *The Pyramids and Temples of Gizeh* (1883); *Tanis*, Memoirs II. and V. of the Egyptian Exploration Fund (1885-87); *Hawara* (1889); *Kahun* (1890); *Ten Years' Diggings* (1893); *A History of Egypt* (2d ed. 1897); *Egyptian Tales* (1895-99); *Religion and Conscience in Ancient Egypt* (1898); *Royal Tombs of the First Dynasty* (1900-01).

PETRIFACTION (from Lat. *petra*, from Gk. *πέτρα*, rock + *facere*, to make). A name given to organic remains found in the strata of the earth, because they are generally more or less mineralized or made into stone. The word has fallen into disuse, having given place to the term fossil (q.v.).

PETRIFIED FORESTS. The same as fossil forests (q. v.).

PETROBRUSIANS. See Bruys, Pierre de.

PETRIFIED WOOD. Plant remains in which the woody tissue has been replaced by mineral matter, usually some form of silica. The name dendrolites has been given to petrified fragments of plants that are commonly found in the coal measures. See Fossil Forests.

PETROGRAPHIC PROVINCE (from Gk. *πέτρα*, *petra*, rock + *γράφειν*, *graphein*, to write). A region within which the igneous rocks reveal a relationship (so-called consanguinity) in chemical composition, which may be referred to a community of origin. This relationship may be chemically a close one, but the rocks have widely varying mineralogical composition, or the kinship may be restricted to one or more of the chemical components in the rocks.

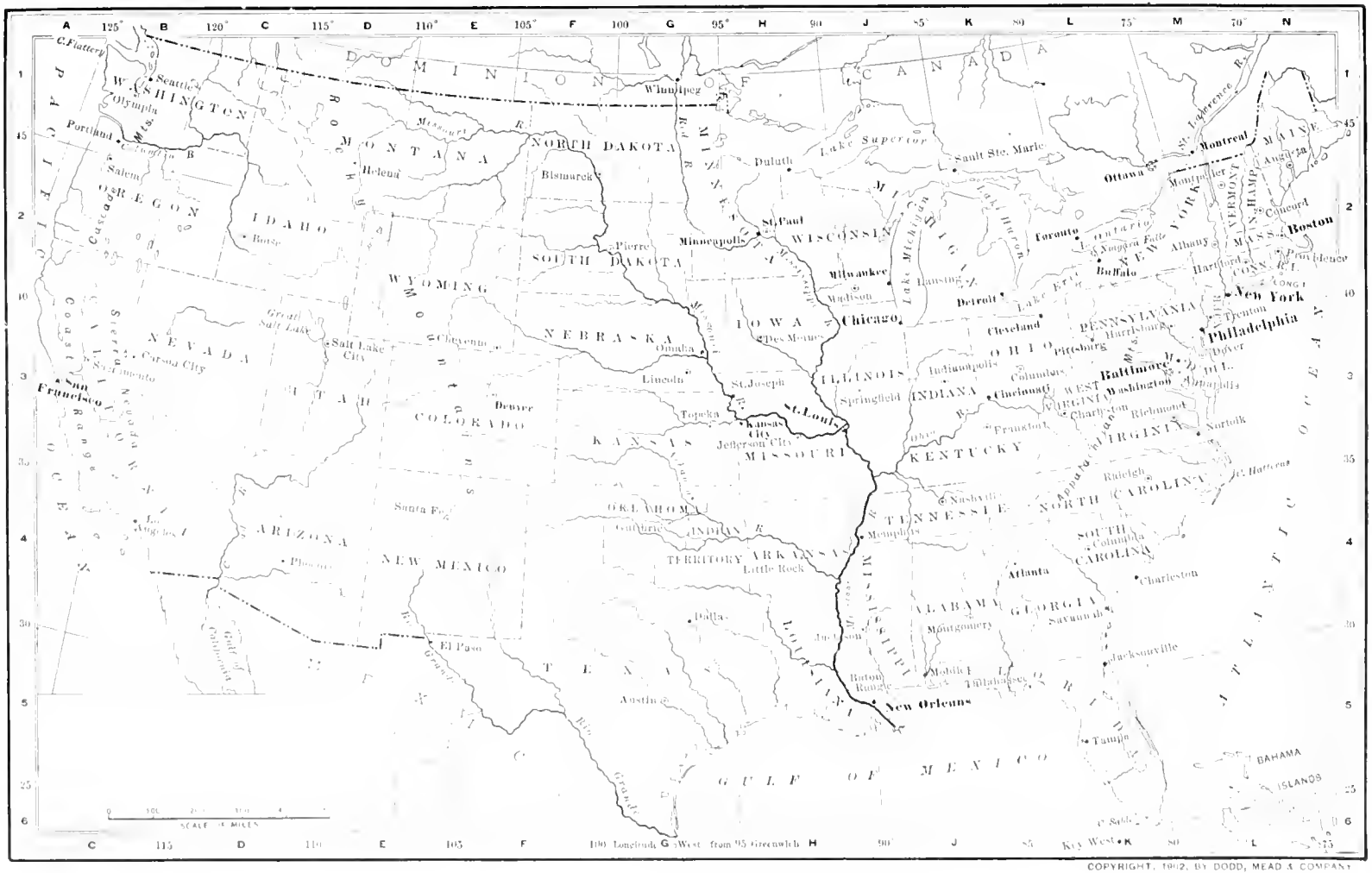
PETROG'RAPHY. See Petrology.

PETROLATUM (Neo-Lat., from ML. *petroleum*, rock oil, from Lat. *petra*, from Gk. *πέτρα*, rock + *oleum*, from Gk. *ἔλαιον*, *elaion*, oil). A residue from the distillation of petroleum, prepared by filtration, and known to the trade by different names, as petroleum jelly, vaseline, and cosmoline. It is an amber-colored, translucent, semi-solid substance, slightly soluble in alcohol, and readily so in ether. It does not become rancid, and is largely used in pharmaceutical preparations, especially ointments, instead of the ordinary fats. It is taken inwardly as a remedy for coughs and colds; it is an excellent lubricant, and will protect polished steel from rust. The term vaseline, while often applied to petrolatum in general, is really a trade name, protected by copyright, belonging to one particular preparation. See Petroleum.

PETRO'LEA. A town of Lambton County, southwestern Ontario, Canada, situated on a branch of the Grand Trunk Railroad, 16 miles east of the Saint Clair River. In the neighborhood are numerous oil wells producing yearly about 20,000 barrels of crude petroleum. Population, in 1891, 4357; in 1901, 4135.

PETROLEUM (ML., rock oil). A natural rock oil composed of hydrocarbons. It is classed with natural gas and asphalt as a bitumen; natural gas containing the more volatile members of the series, asphalt the solid, while petroleum is composed chiefly of the liquid members, although it contains a small proportion of both solid and gaseous compounds. Other names for petroleum are mineral oil, rock oil, and naphtha, the last being employed especially in Europe for the Russian oils.

History. Petroleum has long been known in various parts of the world by its appearance in the form of bituminous springs or as a floating scum on the surface of pools. It was used at a very early period in the walls of Babylon and Nine-



veh, and Herodotus has described the occurrence of oil springs in the island of Zachynthus, now Zante. In Roman times petroleum was obtained from Sicily and burned in lamps. The first mention of petroleum in America (about 1635) is in a letter written by the Franciscan missionary Joseph de la Roche d'Allion, who refers therein to springs found in the region of what is now southwestern New York or northwestern Pennsylvania. The early settlers of Pennsylvania obtained small quantities of oil by digging wells and scooping out the liquid which seeped in from the surrounding rocks. The drilling of brine wells on the western slopes of the Alleghanies in the early part of the nineteenth century led to the discovery of petroleum at greater depths. A well sunk near Burkesville, Ky., in 1829, yielded great quantities of oil, which flowed to the surface and was drained into the Cumberland River, where at one time it was set on fire. The most important application of petroleum in the early days was in medicine; it was utilized as an illuminant only to a small extent, owing to its offensive odor. In the year 1853 Dr. Brewer suggested the use of petroleum for lubricating and illumination purposes, and set to work devising means for purifying the crude product. The Pennsylvania Rock-Oil Company was organized in 1854 to drill for oil; although its first well yielded from 400 to 1000 gallons a day, the company was not successful in its business ventures. Five years later, however, Col. E. L. Drake put down a productive well on land leased from this company, and the successful outcome of this undertaking may be said to mark the beginning of the oil industry in the United States. The news of the discovery was followed by a rush of adventurers from all parts of the country, so that by 1860 more than 100 square miles of territory in the vicinity of Oil Creek had been shown to be productive. Much of the oil which reached the surface was allowed to escape, owing to the lack of storage and transportation facilities. As the explorations were extended new fields were opened along the Allegheny River in Pennsylvania, also in Ohio and West Virginia. The Lima field of Ohio and Indiana was first developed in 1885, while the California fields have become large producers only in the last few years. The discovery made in the Beaumont region of Texas early in 1901, which has been followed by extraordinary development, is the most important event in the recent history of petroleum.

Among foreign countries, Russia is the largest producer of oil and the strongest competitor of the United States in supplying the world's markets. Operations have been conducted in this country since 1873. The largest fields are located on the Apsheron Peninsula, Baku being the chief centre of the industry. The distillation of petroleum from shales was first undertaken in France in 1834, and was successfully introduced into Scotland in 1850. The importation of shale oil into America led to the use of cannel coal for distilling; this industry gained considerable importance in the United States previous to 1860, but quickly succumbed when the first wells became productive.

Origin and Geological Occurrence. The geological history of petroleum and natural gas are closely connected, so that what is said of one practically holds true of the other. Petroleum is always found in sedimentary rocks. For many years it was known only in sandstones or shales, and the term oil-sand was applied to the containing strata. Subsequently oil was struck in limestone in Ohio, thus forming a new type of occurrence, although one which has since proved to be rather unique.

Petroleum is considered by most geologists to have been derived by the destructive distillation of either animal or vegetable matter contained in the rocks. The products of this distillation have in some cases accumulated in the strata in which they were formed, while in others they have escaped upward into the overlying beds, in some instances even reaching the surface.

Petroleum occurs in all geological formations, from the Lower Silurian or Ordovician up to the Tertiary; it is chiefly of importance in the Silurian, Devonian, and Tertiary rocks. The relation of the distribution of oil to geological structure was not recognized until as late a date as about 1880, at which period geologists began to find the cause of oil accumulation and pressure. Prof. Edward Orton, of Ohio, was the most prominent investigator in this field. In all regions where petroleum occurs the strata are not only disturbed, but they are bent into anticlinal or arch-shaped folds. If the rocks are porous the gas tends to collect at the summit of the anticlinal fold or arch, while the oil collects in the flanks of the fold. Salt water is usually associated with the gas and oil, and, being heavier, accumulates in the flanks of the anticlinal or in the neighboring synclinal folds. There is little use of searching for oil in regions where the strata are flat; and it is rarely found in highly folded regions, for where the flanks of the fold have a dip of more than 10° the bending of the rocks is often sufficient to create cracks through which the oil or associated gas will escape to the surface. The rock in which the oil is found is spoken of as the reservoir, or oil-sand, and it is essential that this rock should be porous. The degree of porosity not only influences the quantity of oil which the rock can hold, but it may also influence the rate of flow of the well. Some wells may yield as little as 15 barrels per day; others may reach a production of 50,000 or 60,000 barrels per day. The porosity of the oil-bearing formation may also change from place to place and would account for the location of a profitable well at one point and a barren one a short distance from it. In order to prevent the escape of oil from the containing stratum it should also be overlain by a rock of more or less impervious nature. In many wells the petroleum flows to the surface under pressure. Professor Orton believed that the oil was under hydrostatic pressure; according to his theory, the pressure in different wells of the same basin or pool ought to be nearly constant. In any region, however, the pressure usually diminishes with time. While Orton's theory may be true for Ohio, it seems doubtful whether hydrostatic pressure will account for the great oil and gas pressure found in some regions. The quantity of oil which a given territory can yield is often very great, since some sand will hold as much as one-eighth of its bulk in oil under pressure. This means that there is 1.5 inches of oil to every vertical foot of oil-sand, or about 5000 cubic feet per acre.

Character and Composition. Petroleum is a liquid of varying color, being black, brown, red, amber, or straw, and by reflected light often ap-

[illegible] in tint. The black oils in the [illegible] obtained from the Trenton [illegible] of Ohio and from California; the Pennsylvania oils are of amber tint. In addition to the hydrocarbons, which are the chief constituents of petroleum, the following substances may be present: sulphur, nitrogen, hydrogen sulphide, carbon disulphide, arsenic, and phosphorus. The carbon percentage may vary from 79.5 to 88.7 per cent.; the hydrogen from 9.6 to 14.8 per cent.; the sulphur from 0.7 to 2 per cent., and in rare cases even 3 per cent.; nitrogen from 0.008 to 1.1 per cent. The hydrocarbons of all crude petroleums fall either into the paraffin or olefin group, those of America belonging chiefly to the first and those of Russia to the second group. The number of different members of the paraffin series present may be very large; some Pennsylvania oils, for example, have yielded 18 different paraffin compounds, as well as a number of substances belonging to the ethylene group. The hydrocarbons of the olefin series predominate in the Russian oils and many others. The composition of crude petroleum from a number of different localities is given below:

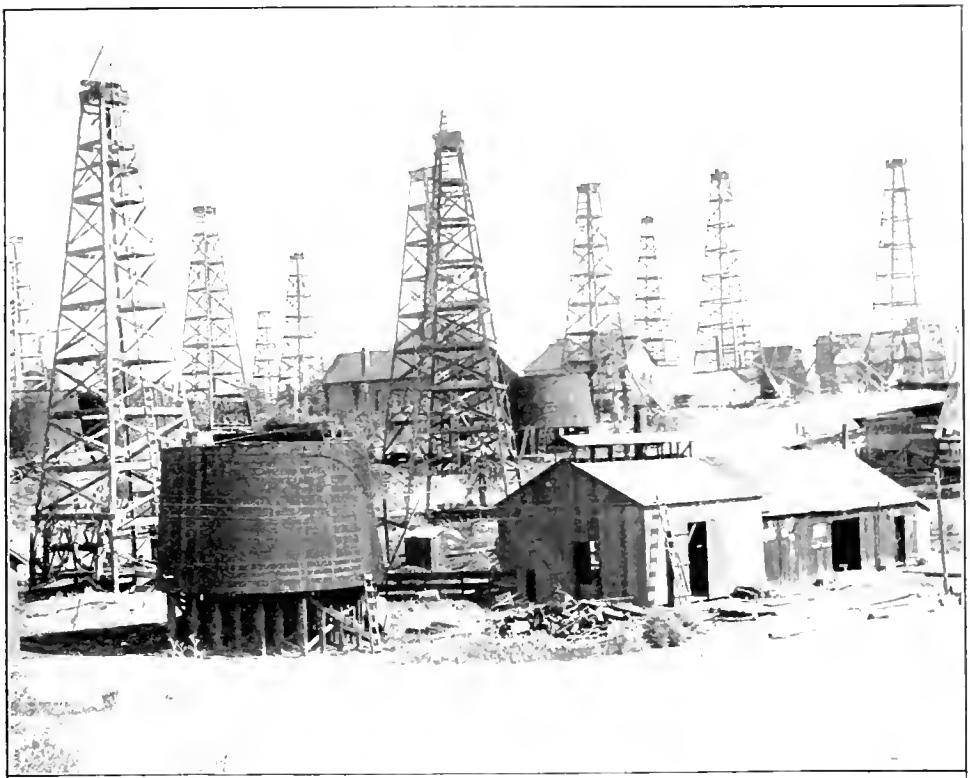
THE CHEMICAL COMPOSITION OF PETROLEUM.

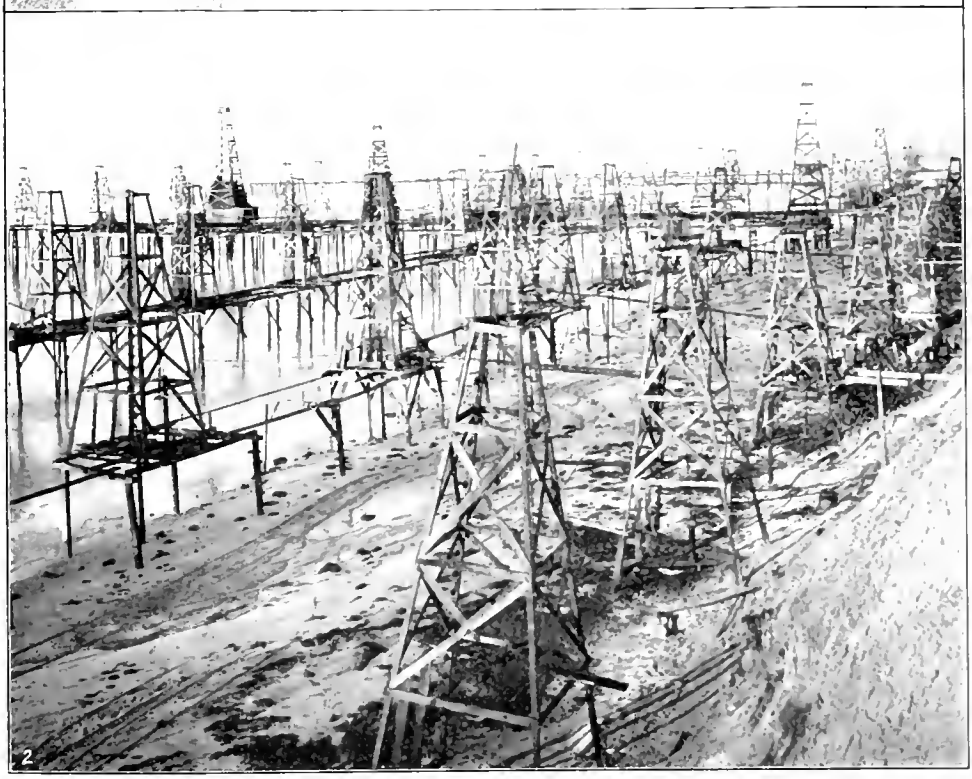
LOCALITY	C	H	O	Specific gravity $H_2O = 1$
	Per cent.	*Per cent.*	*Per cent.*	
Heavy oil, West Virginia	83.5	13.3	3.2	.873
Light oil, West Virginia	84.3	14.1	1.6	.8412
Heavy oil, Pennsylvania	84.9	13.7	1.04	.886
Light oil, Pennsylvania	82.0	14.8	3.2	.816
Parma, Italy	84.0	13.4	1.8	.786
Hanover, Germany	80.4	12.7	6.9	.892
Galicia, Austria	82.2	12.1	5.7	.870
Light oil, Baku, Russia	86.3	13.6	0.1	.884
Heavy oil, Baku, Russia	86.6	12.3	1.1	.938
Java	87.1	12.0	0.9	.923
Beaumont, Texas	86.8	13.2	.....	.920

The gravity of an oil is most commonly expressed in the degrees of the Baumé (B.) scale, on which water has a specific gravity of 10 degrees. The oils from Allegany County, N. Y., run from 38° to 41° B.; from Venango County, Pa., 46° to 48° B.; Warren County, Pa., 43° B.; Lima County, Ohio, 36° to 38° B.; Florence, Colo., 30° B. Russian oils average about 32° B. The lighter oils yield a better quantity of illuminants, while the heavier ones often serve well for lubricating purposes, etc. On exposure to the air many petroleums lose their more volatile constituents and change to a viscous or even solid condition resembling asphalt. The lighter colored varieties are often quite liquid, while the black or dark oils may be slightly viscous. The temperature at which crude petroleum solidifies ranges from 82° F. in some Burma oils to several degrees below zero in certain Italian oils. The flashing point may be equally low in the latter, but in others found on the Gold Coast it rises as high as 370° F. The boiling point likewise shows considerable variation, from 180° F. in some Pennsylvania oils to 338° F. in certain oils found at Hanover, Germany.

DISTRIBUTION OF PETROLEUM. The most noted and most productive field in the United States is the Appalachian, which extends along the western slope of the Appalachian Mountains, from southwestern New York (and eastern Ohio), through western Pennsylvania into West Virginia, Kentucky, and Tennessee. The oil-bearing sandstones are partly Devonian and partly Carboniferous, the latter being especially important in West Virginia. Four fields are recognized in Pennsylvania, the oil varying from amber to dark green. Ohio contains two districts. One of these, the Mecca-Belden field, is of minor importance; a second in eastern Ohio is a westward extension of the West Virginia area. The Lima-Indiana field extends from Lima southwestwardly into Indiana, lying without the Appalachian region as usually defined. The oil here is carried by the Trenton limestone of the Lower Silurian, the depth being about 1300 feet; it was first discovered near Findlay, Ohio. The oil is dark and heavy and resembles the Tennessee and Canada oils in its sulphur contents. Farther south oil is obtained from the Carboniferous in eastern Kentucky and in Tennessee. While new pools are discovered occasionally in the Eastern fields, the most important developments in recent years have been in the Southwestern and Western States.

Oil has been found at a number of localities in the Tertiary rocks of eastern Texas, and several fields, including the Corsicana, Nacogdoches, Beaumont, Elgin, San Antonio, and Sugar Lake, are now being exploited. The first mentioned supplies both light and heavy oils, which are obtained from depths of 950 and 1175 feet respectively. The first well put down in the Beaumont field yielded 75,000 barrels of oil a day, spouting the liquid in a six-inch column to a height of 160 feet; nine days elapsed before the flow was brought under control. The Beaumont oil is a dark asphaltic oil with much sulphur, and is obtained at a depth of 1000 feet. Petroleum has also been discovered in western Louisiana, especially near Jennings, where it is found at a depth of 1800 feet. Southeastern Kansas and northeastern Indian Territory produce some oil from the Cherokee shales and sandstones of the Carboniferous. In Wyoming petroleum occurs in 18 scattered fields, and in formations ranging from the Upper Carboniferous to the Upper Tertiary, but mostly in those of Mesozoic age. The Cretaceous sandstone at Florence, Colo., yields a heavy oil which resembles that of Wyoming in being valuable as a lubricant. Oil has also been obtained in moderate quantities at Boulder, Colo. It is obtained at depths of as much as 2850 feet, and has a gravity of 42.5° B. California contains several oil fields in the southern part of the State. The rocks are of Cretaceous to Neocene age. The oil has an asphaltic base, and is chiefly valuable as a fuel. Petroleum is also known to occur in Washington, Arizona, New Mexico, Montana, and Utah. A moderate amount of oil is obtained from Lambton County, Ontario, at a depth of 400 to 500 feet. Cuba is known to have at





1. OIL WELLS AT LOS ANGELES, CALIFORNIA

2. OIL WELLS ON THE BEACH AT SUMMERFIELD, CALIFORNIA

least small supplies of oil, and a limited quantity has been exported from Porto Rico. In Mexico active exploration has been carried on at several points in the Gulf Coast region with the result of finding supplies of good oil around Tampico. It has an asphalt base. Of the South American countries, Peru is the most important petroleum producer, most of the output coming from the Zorritos field. Petroleum is also said to occur in Venezuela, Argentina, and Ecuador, but it is not taken out of the ground to any extent.

Russia is not only the most important foreign producer of petroleum, but the largest producer in the world, the fields in the Baku region of Southeastern Russia supplying enormous quantities annually. The greater part of the output comes from the Baku field proper, although important quantities are obtained from the Grosni field, 500 miles north of Baku. Rumania contains several promising oil fields, which occur in the same formations as the Russian fields. In Germany oil is obtained near Hanover, and also in Alsace, while some is supplied by the Carboniferous rocks of Great Britain, but does not begin to supply the local demand. In Japan petroleum is obtained on the northwestern coast, and some of it is refined. The crude material sometimes yields 60 per cent. of illuminating and lubricating oils. A high paraffin oil is found in Java, and Sumatra, Borneo, and the Burma field of India are important producers. While petroleum is known to occur in the Philippines, little is obtained, and that by primitive methods; the islands of Panay, Leyte, Guimaras, Negros, Bohol, Mindanao, and Cebú all carry some petroleum.

Mining and Transportation of Petroleum. The modern method of drilling for petroleum is similar to that used in sinking gas and artesian wells. The most prominent feature of the oil-drilling outfit is the derrick, which is a tall, pyramid-like wooden frame about 75 feet high, 12 feet square at the base and about 3 feet at the top. The cost of a rig, as it is called, ranges from $200 to $275. The diameter of the well hole is 10 or 12 inches at the surface, decreasing with depth to 5 or 6 inches. In Russia wells are drilled of much greater diameter, and 26 inches is not an unusual size for the beginning of the bore-hole. In many cases the oil does not flow when the oil-bearing rock is struck, and it is customary in this instance to explode a torpedo at the bottom of the drill-hole, whereupon the oil almost immediately begins to pour out of the well, sometimes with tremendous velocity. For details of petroleum mining, see Well Sinking.

The question of cheap and rapid transportation of crude petroleum from the wells to the refineries is one of great importance. At first the oil was transported on carts, later it was carried in barges or by railway in tank cars, but these methods gave place to the system of pipe lines. At the present day the total length of pipe lines transporting Pennsylvania crude oil is probably over 25,000 miles. The pipes, which have a diameter of from 4 to 8 inches, are usually laid underground and have bends at regular intervals to allow for contraction and expansion. Stations with pumps and storage tanks are placed from 28 to 30 miles apart, the oil being received into the tank at one pumping station and then forced through the pipe to the next one. Since petroleum contains more or less paraffin or wax, much trouble is often experienced in the clogging of the pipes, especially in cold weather, and to clear them out an instrument known as the 'go-devil' is sent through the pipe. This is so constructed that it is forced along by the moving current of oil and scrapes the paraffin off from the inside of the tube. Pipe lines have been built from the Appalachian oil region to Jersey City, Philadelphia, Baltimore, Chicago, and Cleveland.

Refining. The refining of petroleum is based upon the separation of the component hydrocarbons by a process of fractional distillation. This is usually carried out in horizontal cylindrical iron stills, which are surmounted by a dome that connects with a vapor pipe. A common size of still is 30 feet long by 12½ feet in diameter, with a capacity of from 650 to 700 barrels of crude oil. When the latter is placed in the still and subjected to increasing temperature, the oils pass off in the order of their volatility; the separation is not absolutely perfect, however, as oils of lower boiling point may carry over some higher ones. As the vapor rises it passes to the condenser, a series of iron pipes surrounded by cold water. The distillates are led off into their respective tanks. This process of distillation, which is known as the intermittent system, is the one commonly followed in the United States, and the still requires periodic refilling. In Russia a continuous system is employed, involving a series of stills, which are heated to successively higher temperatures. The crude oil then flows slowly from one to the other, and from each one there passes off the product volatilizing at the temperature to which the still is heated.

The process of fractional distillation can be divided into two parts. In the first part of the process the more volatile products, such as gasoline and other naphthas, are evolved. The residue is then transferred to another still in which the second part of the operation is carried on, the oil being heated to a still higher temperature for the purpose of separating the illuminating and lubricating oils. The condensing apparatus ends in the tail house, where the distillates are conducted to their proper tanks. When the various fractions of the distillation are to be kept separate, and of constant composition, a special form of condenser may be used, by means of which the oil is brought into contact with the surface of iron turnings, thereby increasing the evaporation. If the oil contains sulphur it is necessary to redistil it in stills containing copper oxide, which removes the sulphur. *Cracking* is a term used to denote the process of condensing the heavier vapors in the still, causing them to become superheated and decomposed, and thus obtaining a more complete separation of the fractions, as well as increasing the percentage of illuminating oil. In the distillation of the oil the lightest constituents pass off first and the heaviest last. The fractions obtained in the order of their lightness are the following: *Cymogene*. This is the lightest of all, and since its boiling point is 32° F., it is a gas at ordinary temperatures. *Rhigolene*. Boiling point, 65° F. *Petroleum ether*. A highly volatile product having a specific gravity of 0.635. It has sometimes been called Sherwood oil. *Gasoline*. This, properly speaking, is the fraction following petroleum ether, although the name is often applied to a mixture of this and the three previous ones, its gravity thus ranging from 0.635 to 0.690. In

gasoline, or petroleum ether, boiling point ranges from 90° to 200° F. *Naphtha* is a name broadly applied to all light distillates, but more especially to those boiling at 80° to 120° F., and whose gravity varies from as low as 62° B. up to 76° B. *Benzine* (q.v.) represents the least volatile product of the naphthas and has a specific gravity of about 0.73 (57° to 62° B.), and a boiling point of 120° to 150° F. *Ligroine* forms a special grade of solvent naphtha of a specific gravity of 0.715, and a boiling point of 194° to 248° F. Following the lighter naphthas come the illuminating oils, divided into heavy and extra heavy naphthas; in the process of distillation these may either be carried off separately or together. In the former case, the heavy naphthas may be redistilled and separated into benzine and light distillate. The latter may then be mixed with the extra heavy naphthas in varying proportions to form white oil or export oil. There are many grades of domestic illuminating oil or kerosene, which differ chiefly in fire test.

After the naphthas have passed off, the residuum is forced through steam-jacketed filters filled with bone black or fuller's earth; the first portions of the filtrate represent light oils, and are followed by successively heavier ones. When the petroleum belongs to the paraffin group, the residuum is sometimes placed in the tar still for further distillation, and there the heavy vapors are carried over by the aid of superheated steam, the presence of the latter also preventing dissociation of the oil, which if it occurred would be followed by a lowering of viscosity of the lubricating oil and a decrease in the amount of paraffin obtained. The distillates containing the paraffin are freed from the latter by chilling, the effect of this being to cause a separation of the waxy paraffin scales. The oils thus freed from the paraffin are important lubricants, and under this class a number of grades are known as *spindle oil, engine oil, summer dark oil, winter dark oil, cylinder oil, valve oil*, etc. The residue now left in the tar still is a porous mass of separated carbon, solid decomposition products termed coke. The tar is sometimes used without further distillation for the manufacture of vaseline.

Many of the distillates obtained in the treatment of crude petroleum contain acid constituents as well as compounds which in time impart a dark color and unpleasant odor to the distillate. Raw distillates, when used for illuminating purposes, also rapidly char the wick and lose their power of being drawn upward by capillarity. It is therefore customary to purify the various fractions obtained by treatment with sulphuric acid and caustic soda, before they are marketable. The distillate, which has been first cooled to 60° F., is agitated with sulphuric acid in tall cylindrical tanks of wrought iron lined with sheet lead, and known as agitators; about 1½ to 2 per cent. of acid is required. The acid is then washed out with water, and a 1 per cent. solution of caustic soda added, after which a second agitation takes place, followed by washing.

The percentage of the various fractions yielded by different oils varies. Many Pennsylvania oils yield 8 to 10 per cent. naphtha, 70 to 80 per cent. refined oils, 5 to 9 per cent. residuum, and 5 per cent. loss. In the distillation of 100 gallons of crude petroleum there are obtained on the average about 76 gallons of illuminating oil, 11 gallons of gasoline, benzine, and naphtha, and 3 gallons of lubricating oil, while the residuum and loss amount to 10 gallons.

Testing of Refined Oils. Refined oils are usually tested for their color, gravity, flashing and burning points, and sometimes for their behavior when cooled (cold test). The color is determinable by inspection. The gravity is a measure of the purity of the distillate. Too large a proportion of the lighter oils renders the product unsafe for illuminating purposes, while too great a percentage of the heavier oils interferes with its free burning qualities. The gravity test is commonly made by placing the oil in a tall jar and inserting a hydrometer marked preferably with the Baumé scale (water has a value of 10 on this scale). The temperature of oil when this test is made should be 60° F. The fire test includes the determination of the *flashing point*, i.e. the temperature to which the oil must be heated in order to produce a momentary explosion of the mixture of inflammable vapor, and of the *burning point*, i.e. the temperature to which the oil must be heated in contact with the air to take fire and burn on the surface. The burning point is commonly from 6° to 20° C. higher than the flashing point. Kerosene for lighting purposes should have a flashing point of not less than 110° F., and a burning point of not less than 125°. Both the flashing point and burning point are carefully regulated by law in most civilized countries so as to run the minimum risk from explosion. The cold test is of importance for lubricating oils, and is made in order to determine the temperature at which the oil thickens or becomes cloudy. It can be made by cooling the oil in a small tube and noting the temperature at which the oil ceases to flow when the tube is inclined.

Uses. The two chief uses of the distillates from crude petroleum are for illumination and lubrication, but the various fractions in many cases have special applications. Rhigolene is used as a local anæsthetic; petroleum ether is employed as a solvent for caoutchouc, fatty oils, and plant principles, and for carbureting air in gas machines; gasoline is employed in the extraction of oil from oil seeds, in carbureting coal gas, in gasoline lamps, stoves, and plumbers' lamps. Naphthas in general are employed as solvents for resins in varnish-making, and in the manufacture of oilcloth. Boulevard gas fluid is a product of 0.68 specific gravity used in street lamps, while benzoline is a deodorized naphtha of 0.70 specific gravity. Benzine is employed for dry cleaning, as a substitute for and adulterant of turpentine for cleaning printer's type, and for dyers' and painters' use. The benzine of the U. S. Pharmacopœia has a specific gravity of 0.67 to 0.77, and a boiling point of 122° to 144°, and therefore represents a higher distillate. Astral oil and mineral sperm oil are special illuminating oils of high flashing points. Crude petroleum is much used for fuel purposes in engines. Along the Pacific Coast, especially in southern California, where good coal is scarce, the locomotives consume large quantities of crude oil. Paraffin residue is placed on the market for medicinal purposes under the name of vaseline, petroleum ointment, and cosmoline. It is also used in the manufacture of chewing gum, and for insulating purposes in electric work.

Production. The growth of the petroleum industry in the United States is shown in the fol

lowing table, which gives the annual production at intervals from 1859 to 1900:

YEAR	Barrels
1859	2,000
1860	500,000
1865	2,497,700
1870	5,260,745
1875	10,926,945
1880	26,286,123
1885	21,858,785
1890	45,823,579
1895	52,862,276
1900	63,620,529

The production of crude petroleum in the United States in 1901 amounted to 69,389,194 barrels, valued at $66,417,335. Of this quantity, 48.45 per cent. came from the Appalachian field, 31.61 per cent. from the Lima-Indiana area, and 19.94 from the other areas combined. The number of gallons of petroleum and its derivatives exported in 1901 was 1,062,750,306, valued at $71,479,124. This went to all parts of the world, but chiefly to Europe. In this same year the quantity of manufactured petroleum exported by Russia was 36.8 per cent. of that exported by the United States. New York is the leading port of exportation, with Philadelphia second. So large has the export trade become that some countries have a large fleet of specially constructed tank steamers engaged in the oil-carrying trade. Up to 1899 the total tonnage of these was nearly 400,000 tons. The world's production of petroleum in 1901 was as follows:

	Barrels
United States	69,389,194
Russia	85,168,556
Galicia	3,251,544
Sumatra, Java, Borneo	3,038,700
India	1,430,716
Rumania	1,106,460
Canada	704,872
Japan	600,000
Germany	313,630
Peru	72,761
Italy	10,100

See SHALE OIL; ASPHALT; GAS, NATURAL.

BIBLIOGRAPHY. GENERAL, ON REFINING AND PROPERTIES. Thomson and Redwood, *Handbook of Petroleum* (London, 1901); Redwood, *A Treatise on Petroleum* (ib., 1901); "Petroleum," in *The Mineral Industry*, vol. ii. (New York, 1893); Sadtler, "The Technical Utilization of Petroleum and Its Products," in *The Mineral Industry*, vol. iv. (ib., 1895); Folger, "Petroleum: Its Production and Products," in *Annual Report of Secretary of Internal Affairs, Pennsylvania*, pt. III. (Harrisburg, 1892); Series of Papers by Sadtler, Peckham, Day, Phillips, and Mabery on the "Origin and Chemical Composition of Petroleum," in *Proceedings of the American Philosophical Society*, vol. xxxvi. (Philadelphia, 1899); Peckham, "Petroleum," *Report of Tenth Census* (Washington, 1881).

ORIGIN. Orton, "The Origin and Accumulation of Petroleum and Natural Gas," in *Ohio Geological Survey*, vol. vi. (Columbus, 1888); Orton, "Geological Probabilities as to Petroleum," in *Bulletin of the Geographical Society of America*, vol. ix. (Rochester, 1898).

DISTRIBUTION. Van Ingen, "Petroleum in New York," *Bulletin of New York State Museum*, vol. iii., No. 15 (Albany, 1896); Orton, "Petroleum and Natural Gas in New York," *Bulletin of New York State Museum*, vol. vi. (ib., 1899); Bishop, "Oil and Gas in Southwestern New York," *New York State Museum, 53d Annual Report*, vol. i. (ib., 1901); Phillips and Carll, "On the Oil and Gas Region of Pennsylvania," in *Second Geological Survey of Pennsylvania, Annual Report for 1885* (Harrisburg, 1887). Consult also many other articles in other volumes of the Second Geological Survey, notably reports iii., xiv. and xv.; White, "Oil in West Virginia," *West Virginia Geological Survey*, vol. i. (Morgantown, 1899); White, "The Mannington Oil Field and the History of Its Development," *Bulletin of Geographical Society of America*, vol. iii. (Rochester, 1892); Orton, "Petroleum and Natural Gas," in *Kentucky Geological Survey*, report for 1894 (Frankfort, 1895); Orton, "The Trenton Limestone as a Source of Petroleum and Inflammable Gas in Ohio and Indiana," *Eighth Annual Report U. S. Geological Survey*, pt. ii. (Washington, 1889); various articles by Blatchley on Petroleum in Indiana in the *Annual Reports of the Department of Geology and Natural History* (Indianapolis), and also the *Reports of the Oil Inspectors* in the same volumes; Phillips, "Texas Petroleum," in *Texas University Mineral Survey, Bulletin No. 1* (Austin, 1900); "The New Oil Gusher at Jennings, Louisiana," in *Engineering and Mining Journal*, vol. lxxiv. (New York, 1902); Adams, "The Oil and Gas Fields of the Western Interior and Northern Texas Coal Measures and of the Upper Cretaceous and Territory of the Western Gulf Coast," *Bulletin of United States Geological Survey*, No. 184 (Washington, 1901); Haworth, "Oil and Gas in Kansas," *Kansas Geological Survey*, vol. i. (Topeka, 1896); Eldridge, "The Florence (Colo.) Oil Field," *Transactions of the American Institute of Mining Engineers*, vol. xx. (New York, 1891); Knight and Slosson, "The Dutton, Rattlesnake, Arago, Oil Mountain, and Powder River Oil Fields," *Wyoming University School of Mines Bulletin No. 1, Petroleum Series* (Laramie, 1901); Knight, "Oil in Wyoming," *University of Wyoming, School of Mines Bulletin, No. 2* (Laramie, 1897); Watts, "Petroleum in California," *Transactions of the American Institute of Mining Engineers*, vol. xxix. (New York, 1900); Watts, "Oil and Gas Yielding Formations in California," *Bulletin of the California State Mining Bureau, No. 19* (San Francisco, 1901).

FOREIGN. Vaughan, "Bitumen in Cuba," *Engineering and Mining Journal*, vol. lxxiii. (New York, 1902); Tanasescu, "Petroleum in Roumania," *Journal of the Iron and Steel Institute*, pt. I (London, 1901); Spurr, "Mineral Resources of Turkey, Pt. ii., Oil and Gas," *Engineering and Mining Journal*, vol. lxxiv. (New York, 1902). For Russian petroleum, consult *Mineral Resources, United States Geological Survey, 1900* (Washington, 1901). For information regarding foreign occurrences and industry, see also the volumes on *Mineral Resources*, published annually by the United States Geological Survey, and also *The Mineral Industry* (New York), published annually by the *Engineering and Mining Journal*.

PETROL'OGY (from Gk. πέτρα, *petra*, rock + -λογία, *-logia*, account, from λέγειν, *legein*, to say). PETROGRAPHY. LITHOLOGY (obsolescent). The science which treats of the materials of the stony portion of the earth (the lithosphere), and of meteoritic bodies. Petrography is the purely descriptive division of the science, but in general usage it has the same scope as petrology. Petrology, or petrography, is one of the geological

science and ... the same rank as mineralogy. It concerns itself chiefly with the composition (chemical and mineralogical), textures, origin, and alterations of the rocks; and its methods are largely those of chemistry, mineralogy, and physical optics. It is one of the newest of the sciences and may be said to have had its birth in 1862, when Sorby and Zirkel succeeded in preparing transparent rock sections and adapting the microscope to their study. Consult: Harker, *Petrology for Students* (Cambridge, 1895); Teall, *British Petrography* (London, 1888); Zirkel, *Lehrbuch der Petrographie* (2d ed., Leipzig, 1894); Rosenbusch, *Elemente der Gesteinslehre* (Stuttgart, 1898); id., *Mikroskopische Physiographie der Mineralien und Gesteine* (3d ed., ib., 1896; first volume translated by Iddings, under title, *Microscopical Physiography of the Rock-Making Minerals*, 4th ed., New York, 1900). See ROCK.

PETRO'NIUS, GAIUS. A Roman voluptuary at the Court of Nero, whose profligacy is said to have been of the most superb and elegant description. We know, however, very little about him. He was at one time proconsul of Bithynia, was subsequently appointed consul, and is said to have performed his official duties with energy and prudence. But his grand ambition was to shine as a Court exquisite. He was intrusted by his Imperial master and companion with the charge of the royal entertainments, and thus obtained (according to Tacitus) the title of *Arbiter Elegantiæ*. The influence which he thus acquired was the cause of his ruin. Tigellinus, another favorite of Nero, conceived a hatred of Petronius, brought false accusations against him, and succeeded in getting his whole household arrested. Petronius saw that his destruction was inevitable, and committed suicide, A.D. 66, but in languid and graceful style, such, he thought, as became his life. He opened some veins, but every now and then applied bandages to them, and thus stopped the flow of blood, so that he was for a while enabled to gossip gayly with his friends, and even to appear in the streets of Cumæ, before he died. We are told that he wrote, sealed, and dispatched to Nero, a few hours before his death, a paper containing an account of the tyrant's crimes and flagitious deeds. Petronius is generally believed to have been the author of a very remarkable ancient romance, or satire, which has survived in part under the name of *Petronii Arbitri Satyricon*, an extensive work of fiction, of which fragments and a long episode entitled *The Supper of Trimalchio* (*Cena Trimalchionis*) were discovered in the seventeenth century and published at Paris in 1664. As a description of one phase of life in the first century of the Christian Era the work is invaluable, while to the student of Latin it offers the best example of the colloquial language of the time. The exaggerated picture of the vulgar society of a *nouveau riche* is often disagreeable, but always amusing. The scene is laid in some small but fashionable town of Campania, perhaps Baiæ or Puteoli probably under Nero, or shortly before. The standard text is that of Büchcler (Berlin, 1862, with a smaller edition (Berlin, 1895). There is also edition of the *Cena* episode alone, with German translation and commentary, by Friedländer (Leipzig, 1891), and an edition with introduction and commentary by Waters (Boston, 1901). All or the greater part were translated into English by Kelly (London, 1856); and there is a recent and very sympathetic translation of the *Cena*, with an excellent introduction, by Peck (New York, 1898). For the vocabulary of Petronius, see the *Lexicon Petronianum* of Segebade and Lemmatzsch (Leipzig, 1898). Compare, also, Collignon, *Etude sur Pétrone* (Paris, 1892).

PETROPAVLOVSK, pyĕ'trô-pâv-lôfsk'. A district town in the Territory of Akmolinsk, West Siberia, situated on the Ishim and the Trans-Siberian Railway, 191 miles west by rail from Omsk (Map: Asia, F 3). Tallow and leather are the chief products; there is a considerable trade in animals, animal products and manufactures, with the native tribes. Population, in 1897, 20,014.

PETROPAVLOVSK. The chief town of Kamtchatka (q.v.).

PETROPOLIS, pā-trō'pō-lēs. The capital of the State of Rio de Janeiro, Brazil, situated in a mountainous region about 20 miles north of Rio de Janeiro (Map: Brazil, J 8). It was formerly the summer residence of the Imperial Court, and contains a palace, a number of magnificent villas, hotels, and parks. The place was first colonized by Germans in 1845, and a considerable portion of its present population is of German origin. It was made the capital of the State in 1894. Population, in 1898, estimated at 12,000.

PETROVSK, pyĕ-trôfsk'. Capital of a district in the Government of Saratov, Russia, 93 miles northwest of Saratov (Map: Russia, G 4). The manufacture of flour and butter is extensively carried on. Population, in 1897, 13,200.

PETROVSKOYE, pyĕ-trôf'skoi-*e*. A village in Russia. See BUTURLINOVKA.

PETROZAVODSK, pyĕ'trô-zä-vôtsk'. The capital of the Government of Olonetz, Russia, situated on the western shore of Lake Onega, about 190 miles northeast of Saint Petersburg (Map: Russia, D 2). It has a gymnasium, a theological seminary, and a famous Government cannon foundry. The town grew up around an iron foundry established in 1703 by Peter the Great. Population, in 1897, 12,965.

PETRUCCI, pā-trōō'chē, OTTAVIANO DE' (1466-1539). The discoverer of the art of printing music with movable types. He was born at Fossombrone, near Urbino (Lat. *Forum Sempronii*, from which Petrucci adopted the name *Petrutius Forosempronensis*). The Council of Venice gave him a monopoly of his invention for twenty years (1498-1518), and from 1501 to 1511 he developed his discovery with profit to himself, but finally attempted experiments that proved too costly and so was compelled to sell his privilege and business to Amadeo Scotti and Niccoli da Rafael, upon which he returned to his native town. Securing a privilege for the Papal States for a term of fifteen years, he commenced work again in his home town, but with very much inferior results. Petrucci prints are exceedingly rare, and are very valuable. They are remarkable for their neatness of execution and correctness.

PETRUCHIO, pā-trōō'kē-ō. The husband of Katharine in Shakespeare's *Taming of the Shrew*. In taming his spoiled, headstrong wife, he resolves "to kill her in her own humor," and storms like a madman, thwarting all her wishes, yet

never losing his good humor, and at last conquering her.

PETTENKOFEN, pĕt'ten-kō'fen, AUGUST VON (1822-89). An Austrian genre and military painter, born in Vienna. He had been a cavalry officer, and several of his pictures represent military scenes. He also treated subjects from the peasant life of Hungary, often in its brighter aspects. His works include "Hungarian Artillery on the March"; "The Ambulance Wagon" and "Hungarian Volunteers," both owned by Mrs. W. H. Vanderbilt, New York City; "A Rendezvous" (1867), Vienna Museum; and "A Woman Spinning." He was made a member of the Vienna Academy in 1866, and of the Munich Academy in 1867, and was knighted in 1876.

PETTENKOFER, pĕt'ten-kō'fĕr, MAX VON (1818-1901). A celebrated German chemist and hygienist, born in Bavaria. He studied medicine and chemistry at Munich, and later under Liebig at Giessen. In 1847 he became professor of medical chemistry at Munich. His famous researches formed the foundation of the science of experimental hygiene. At his instance chairs of hygiene were founded at the Bavarian universities, and he himself accepted the professorship at Munich in 1865. He became co-editor of the *Zeitschrift für Biologie* in 1864, and was for years one of the editors of the *Archiv für Hygiene*, which he founded in 1883. In recognition of his services to science, many honors were bestowed upon him, and in 1889 he was chosen president of the Bavarian Academy of Sciences. Pettenkofer carried out a number of interesting and useful investigations in chemistry. He is best known, however, for his experimental researches on the ventilation of dwellings, on respiration and the metabolic assimilation of food, and on cholera. The researches on metabolism were carried out, jointly with Karl Voit, by the use of an apparatus of Pettenkofer's invention, which permits the determination with great precision of the amount of atmospheric oxygen used up by the body and the amount of carbonic acid and water-vapor given off. As to cholera Pettenkofer was the first to show: that the symptoms of that disease are caused by the activity of a specific germ, which may be disseminated through ground-water; that the spread of the disease is dependent to a great extent on local climatic and sanitary conditions; and that infection is due largely to individual predisposition. Most of his contributions appeared in the *Zeitschrift für Biologie*, mentioned above. He published besides: *Untersuchungen über die Verbreitungsart der Cholera* (1855); *Ueber den Luftwechsel in Wohngebäuden* (1858); *Zum gegenwärtigen Stand der Choleralrage* (1887), etc. His *Beziehungen der Luft zu Kleidung, Wohnung und Boden; Was man gegen die Cholera thun kann; Populäre Vorträge*, and other works, have passed through several editions.

PETTIE, pĕt'i, JOHN (1839-93). An English painter, born at East Linton, Haddingtonshire. He studied under Lauder at the Trustees' Academy in Edinburgh. Afterwards he lived in London, and for a while had a studio with Orchardson. His figures are usually in the costume of the sixteenth or seventeenth century. His compositions are animated and pictorial, and his color schemes are rich and well handled. His works include: "Edward VI. Signing a Death Warrant" (1879, now at Hamburg); "The Body Guard"; "A Challenge"; and "The Chieftain's Candlesticks." He was elected to the Royal Academy in 1873.

PETTIGREW, JAMES BELL (1834—). An English physiologist, born at Roxhille, Lanarkshire. He was educated at Glasgow University, studied medicine at Edinburgh, and, after acting as Croonian lecturer to the Royal Society (1860), as assistant curator of the Hunterian Museum in London (1862-68), and as curator of the Edinburgh Museum of the Royal College of Surgeons, became lecturer on physiology at Edinburgh (1873), and Chandos professor of medicine and anatomy at Saint Andrews (1875). Pettigrew made a special study of organic muscles, and, with the purpose of analyzing the problem of the flying machine, of the wings of insects, bats, and birds. His writings include *Animal Locomotion* (1873), and many contributions to scientific journals.

PETTIGREW, JAMES JOHNSTON (1828-63). An American soldier, born in Tyrrell County, N. C. He graduated at the University of North Carolina in 1847, and was appointed by President Polk assistant professor in the Naval Observatory. In 1848 he resigned, to study law. He visited Europe in 1850 and for a time acted as secretary of the Spanish Legation. In 1852 he returned to the practice of law in Charleston, and was a member of the Legislature in 1856. He joined the Sardinian Army in 1858, but the armistice of Villafranca destroyed his hopes of active service. After a visit to Spain he returned to Charleston to practice law, and was prominent in militia affairs. He took part in the first operations of the war at Castle Pinckney and Morris Island, and in May, 1861, was made colonel of the Twenty-second North Carolina Regiment. In the spring of 1862 he was promoted to brigadier-general, and assigned to the Peninsula. He was wounded and captured at Seven Pines (May 31st), and after exchange was assigned to command a new brigade of North Carolinians at Petersburg. In the fall of 1862 he made an unsuccessful attempt to recapture Newbern, N. C., and he opposed Stoneman before Richmond early in 1863. At the battle of Gettysburg (July 1st-3d) his brigade, a part of Heth's division, A. P. Hill's corps, opposed the famous Iron Brigade the first day and lost one-third of its numbers. One regiment, the 26th North Carolina, lost in killed and wounded 584 out of 820. On the third day he commanded Heth's division. In the famous charge on Cemetery Ridge this division formed the left of the assaulting force. Owing to a sharp change in the direction of the stone wall, at the 'Bloody Angle,' which made it 80 yards farther from the Confederate lines, it has been officially shown that men of this division went at least 40 yards farther up the hill than those of Pickett's. Pettigrew's brigade had left 935 men and was commanded by a major, the only field officer left. On the retreat he was mortally wounded by Federal cavalry at Falling Waters, July 14th, and died at Bunker Hill, Va., July 17th. For his part in this battle consult *North Carolina Regiments, 1861-65*, vol. v., published by the State (1901).

PETTY, Sir WILLIAM (1623-87). An English political economist, born at Romsey, in Hampshire. After studying at the Jesuit College at Caen, in Normandy, he returned to England and

entered the Royal Navy. On the outbreak of the Civil War he retired to the Continent and studied at Utrecht, Amsterdam, Leyden, and Paris. He returned to England and took the degree of doctor of physic at Oxford in 1649, and was soon after appointed fellow of Brasenose College. In 1651 he became professor of anatomy, and in 1652 was appointed physician-general to the army in Ireland. His intimacy with Henry Cromwell and other members of the Cromwellian party involved him in the downfall of the Protectorate, but he soon won the confidence of Charles II. He was one of the founders of the Royal Society, which was incorporated in 1662. He was one of the authors of *Natural and Political Observations*, published in 1662, which was the first book on vital statistics ever written. Ten years later his *Political Anatomy of Ireland* appeared. His later works were: *Quantulumcunque Concerning Money* (1682); *Observations upon the Cities of London and Rome* (1687); and a number of *Essays in Political Arithmetick*, published between 1683 and 1690.

PETTY BAG OFFICE. An office attached to the Court of Chancery in England, prior to 1874, for the care of suits for and against solicitors and officers of the court; for all judicial matters relating to statutes, recognizances, writs of *scire facias* and other writs, and certain other matters relating to the Crown. The name was derived from the custom of keeping the writs and returns in a little sack or bag (*in parvâ bagâ*). A great deal of miscellaneous business was also transacted in the Petty Bag Office, which the Lord Chancellor and Master of the Rolls were empowered to regulate and transfer from time to time. When the jurisdiction of the Court of Chancery was transferred to the High Court of Justice by the Judicature Acts in 1874, the office of the clerk of the petty bag was abolished, and his duties and powers are now vested in the senior clerk of the Crown Office department of the Central Office.

PETTY-FITZMAURICE, pĕt'tĭ-fĭts-mą'rĭs. See SHELBURNE.

PETTY OFFICER. A term applied in the navy to the men of the enlisted force who are appointed to position below the rank of warrant officer; these positions or 'ratings' correspond to the non-commissioned grades of the army, but they are much more numerous. The rates of pay are from $30 to $70 per month. (See section on *Navy*, under UNITED STATES.) The most capable and deserving petty officers are promoted to warrant rank as vacancies occur in the grades of boatswain, gunner, and carpenter; and, if exceptionally meritorious and well informed, they may then be commissioned ensigns in the regular line of promotion, but not more than twelve may be commissioned in any one year.

PETTY SESSIONS. An English court, constituted by two or more justices of the peace, or a borough magistrate, when sitting for the trial of certain minor criminal cases, or for the preliminary hearing and commitment for trial of persons accused of graver crimes, which can only be tried at Quarter Sessions. The jurisdiction of the justices in Petty Sessions is mainly over violations of certain special acts, such as those concerning poaching, vagrants, bastardy proceedings, absconding workmen, apprentices, poor laws, etc. One of the important functions of this court is to hear charges for all indictable offenses, and to commit the accused person for trial at Quarter Sessions, if a probable case is made out against him. The jurisdiction of Petty Sessions and Special Sessions is practically the same, except that the latter court is only held on special notice. Appeals from Petty Sessions are heard in the Court of Quarter Sessions. See JUSTICES OF THE PEACE; SPECIAL SESSIONS; QUARTER SESSIONS.

PETU'NIA (Neo-Lat., from Brazilian *petun*, tobacco). A genus of plants of the natural order Solanaceæ, natives of South America, and during the nineteenth century introduced into cultivation in other countries for their beautiful flowers. Although naturally perennials, they are generally cultivated as garden annuals. The slightly viscid foliage emits a peculiar, often disagreeable odor, especially in the evening or during stormy weather. The common garden petunias are mostly hybrids of *Petunia nyctaginiflora* and *Petunia violacea*, which themselves are not frequently cultivated. *Petunia nyctaginiflora* is a stout species with white flowers; *Petunia violacea*, a trailing plant with purplish violet blossoms. The number of varieties is very large and includes single and double flowered forms, plain or variegated, with innumerable variations in color from pure white to deep violet, through rose, purple, pink, and many other shades. The finest flowers are produced on deep rich soils in sunny situations. They are well adapted for beds and borders and are also grown as house and conservatory plants. Since seedlings do not come true to the parent plant, the choice varieties are propagated by cuttings. These are put in sandy soil with bottom heat in August, potted singly after they have rooted, wintered in the greenhouse, and set out in the open in late spring.

PEUCER, poi'tsĕr, KASPAR (1525-1602). A German scientist and scholar, son-in-law of Melanchthon. He was born at Bautzen and studied at Wittenberg, where he was made professor of mathematics in 1554 and of medicine in 1560. But in 1574 he was removed from his position as rector of the university, because of his intimate relations with Crypto-Calvinists. After twelve years' imprisonment, Peucer was freed and became Court physician to the Prince of Anhalt. He wrote on astronomy, geometry, and medicine, and edited some of Melanchthon's letters (1565 and 1570). Consult Henke, *Kaspar Peucer und Nikolaus Crell* (Marburg, 1865).

PEUERBACH, poi'ĕr-bâḥ, **PURBACH,** or **PEURBACH,** GEORG VON (1423-61). An Austrian mathematician and astronomer, born at Peurbach, near Linz. He studied in Vienna, and afterwards traveled in Germany, France, and Italy, where he delivered astronomical lectures at Ferrara, Bologna, and Padua. In 1454 he was astronomer to King Ladislas of Hungary, and somewhat later professor at the University of Vienna, and with Regiomontanus one of the leaders in mathematical thought in his century. Peuerbach compiled a table of sines, taking $60 \cdot 10^4$ for unity or the length of the radius, and thus prepared the way for decimal fractions. The table was completed after his death by his pupil Regiomontanus. Peuerbach also calculated new tables of the planets, and gave a new list

of the fixed stars. He wrote: *Tractatus Super Propositiones Ptolemæi de Sinibus et Chordis* (1541); *Theoricæ Novæ Planetarum* (1542); *Sex Priores Libri Systematis Almagesti* (1496, 1550); *Institutiones in Arithmeticam* (1511); *Tabulæ Eclipsium* (1514). With Regiomontanus he wrote an *Epitome in Cl. Ptolemæi Magnum Compositionem* (1543). Consult: Schubert, *Peuerbach und Regiomontanus* (Erlangen, 1828); Fiedler, *Peurbach und Regiomontanus, eine biographische Skizze* (Leobschütz, 1870).

PEUTINGER, poi'ting-ẽr, KONRAD (1465-1547). A German antiquary, born at Augsburg. He studied law at Padua, and at twenty-eight became syndic of his native city, which he represented in several Diets, notably that of Worms in 1521. His writings on classical antiquities were very valuable; the most important is *Inscriptiones Romanæ* (1520). He is best known as owner of the *Tabula Peutingeriana*. Consult the reproduction edited by Mannert (Ravensburg, 1888), and Herberger, *Konrad Peutinger in seinem Verhältnis zu Kaiser Maximilian* (Augsburg, 1851).

PEUTINGERIAN TABLE (Lat. *Tabula Peutingeriana*). The name given to a most interesting ancient document, which exhibits the military roads of the Roman Empire and of the world known to the Romans. It is not, properly speaking, a map, no regard being paid to geographic position or the extent of countries. The great lines of road are laid down in a narrow strip, as if nearly parallel, all proceeding from Rome as a centre; and as to rivers, it only appears whether they cross the road from left to right or from right to left of the traveler proceeding from Rome. The Mediterranean and other seas are represented by mere narrow channels. A small house is the mark for a town; important towns and military stations are distinguished by walls and towers. Rome, Constantinople, and Antioch are each represented by a circle, within which is a human figure seated; in the case of Rome the figure is crowned. Until very recently a portion of the only copy of this valuable relic of antiquity known to exist was evidently wanting, as it terminated abruptly on the west at the confines of Spain, and included only the eastern parts of Britain. In the east it traces roads through India to a number of places of trade as far as the mouths of the Ganges. It is on parchment, and, as described in all the publications devoted to it, 21 feet in length, and about one foot wide. The extant document seems to be a thirteenth-century copy of an original made in the third century. It was found in the library of the Benedictine monastery at Tegernsee, in Upper Bavaria, in the fifteenth century, by Konrad Celtes, who bequeathed it to Konrad Peutinger of Augsburg, a zealous antiquary, and one of the earliest writers on the Roman and other antiquities of Germany. Peutinger began to prepare a copy of it for publication, but died before he could accomplish his purpose, which, however, was partially executed by Mark Welser, in his *Fragmenta Tabulæ Antiquæ ex Peutingerorum Bibliotheca* (Venice, 1591). The ancient document itself remained in the hands of the Peutinger family, and attracted no further notice till it was offered for sale in 1714, and purchased by Prince Eugene, who presented it to the Imperial Library of Vienna, in which it still remains. An exact copy of it was published at Vienna in 1753, with an introduction and index by F. C. von Scheyb. It was again published as an appendix to Katancsich's *Orbis Antiquus* (Budapest, 1825); and at the request of the Academy of Munich, a revised edition was published by Konrad Mannert (Leipzig, 1824). Since that time a leaf detached from the sheets forming the map has been found in the Imperial Library at Vienna. See Miller's edition of the same (Ravensburg, 1888), and a colored facsimile by Desjardins (Paris, 1869-71).

PEV'ERIL OF THE PEAK. A novel by Sir Walter Scott (1823). It is a story of the Popish Plot in the reign of Charles II., in which the hero, Julian Peveril, becomes involved because of his connection with the Countess of Derby, the family estate being near the Peak of Derbyshire.

PEW (OF. *pui, puy, poi, pu*, elevated place or seat, hill, mound, *puy*, elevated railed balcony or gallery, from Lat. *podium*, balcony, from Gk. *πόδιον*, diminutive of *πούς, pous*, foot). An inclosed seat in a church, appropriated to a person or family. Such seats were in use in English churches some time before the Reformation. They were originally plain fixed benches, with partitions of wainscoting about three feet high, and sides of the width of the seat, paneled or carved. In the later Reformation period and probably under the influence of the Puritans, who, objecting to some parts of the service which they were compelled to attend, sought means to conceal their non-conformity, pews grew into large and high inclosures, containing from two to four seats, and fitted with doors, desks, and cushions. At first pews seem to have been assigned only to the patrons of churches, but gradually the system of appropriation was extended. It would appear by the common law of England that every parishioner has a right to a seat in the church, and that the churchwardens are bound to provide for each one as best they can. So, also, by the common law, the right to a pew is only a right to use it for the services of the church, and at times when it is open for use, subject to the regulations of the church; and there is no right of access to it for any other purpose except repairs. In the United States pews are sometimes the property of the church congregation and sold or rented for them, or they are individually owned or leased on perpetual leases subject to a ground rent. Whether property in pews is real or personal now depends in many States upon the provisions of the statute law. The right of property in the pews of a church vests in the trustees, while the right of use and occupation at all customary times is in the purchaser or lessee, and the latter may maintain an action on the case for a disturbance of this right.

PEW RIGHTS. By the early common law, a person could not obtain strictly legal rights to a church pew. However, at a later date it was recognized that a legal right to a pew could be acquired, which would be protected by the common-law courts. Finally, exclusive pew rights, when purchased by the pewholder, were considered as incorporeal rights or interests in the real property, subject to the superior right of the trustees or church corporation to deal with the building as might seem best for the interests of the church. For example, the church trustees could rebuild the church, or sell it and rebuild

on another site, without making compensation to the pewholders. In such cases, however, by the weight of authority, a pewholder would be entitled to a pew of like character in the new edifice. However, if the church corporation is dissolved, the pewholders are entitled to have the value of their pew rights returned out of the church funds. A pewholder has practically no more substantial rights under a sale to him of the pew than under a perpetual lease, as he cannot in any event change the character of the pew as to decorations, etc., and cannot prevent the church authorities from making alterations, etc. The common law above set forth prevails in most of the United States. A few States have passed statutes expressly making pew rights real property, and in others the statutes define such rights as personal property. In most churches, however, pews are let from year to year by a sort of verbal lease, and the pewholders merely have temporary possessory rights. Consult Phillimore, *Ecclesiastical Law of the Church of England* (2d ed., London, 1895); and the authorities referred to under Real Property.

PEWEE (onomatopoetic name). Any of several small olive-green or brown American tyrant flycatchers (q.v.). The common pewee or phœbe-bird (*Sayornis Phœbe*) measures about 12 inches across the extended wings. It is brown on the back, darker on the head, with a yellowish-white breast and belly, quills brown, slightly edged with a lighter color. Its principal habitat is the Middle and Atlantic States. It comes north in April, and usually hatches a brood by the middle of May and another by the first of August. In October it returns to the south, migrating at night. It placed its nest originally on a ledge of rocks, or plastered it bracket-like against the surface of a mossy cliff, but now more frequently chooses a beam or ratter of a building or bridge. The nest is made of mud, grass, mosses, and the like, and is lined with down and other soft materials; but these materials seem so favorable for the breeding of parasites that the second brood is often raised in a new nest. It lays from four to six eggs, white, rarely with a few reddish spots at the larger end. The hatching takes about thirteen days, and in a few days more the young birds leave the nest. The pewee occurs as far west as eastern Nebraska. Its food consists wholly of insects, captured usually on the wing. Its plaintive note, *phœbe*, is well known. Two allied species, Say's pewee (*Sayornis Sayi*) and *Sayornis nigricans*, occur in the Western States. The former is grayish-brown, with cinnamon belly and black tail, while the latter is blackish, with a white belly.

The very familiar wood pewee (*Contopus virens*) measures from 10 to 11 inches across the outspread wings, with the color of the back much like that of the phœbe-bird, but it has two pale grayish bands across the wings, a narrow whitish circlet around the eyes, a greenish-yellow belly, and grayish throat and breast. Its flight is rapid, with sudden sweeps when darting after its insect prey, which it pursues in the shade of the orchard or woods. Its note is much slower and more plaintive than that of the phœbe and is more frequently single-syllabled. It comes north two or three weeks later than the phœbe, going as far north as New Brunswick and Nova Scotia, and retreating as far south in the winter as New Granada. The nest is saddled upon the branch of a tree and is notable for the skill with which it is covered with lichens, so that it very closely resembles a natural wart on the limb. The eggs are four or five, light yellowish, with reddish and lilac spots at the larger end. The pewee is very courageous, defending its nest against all intruders. Two broods are raised where the season is long enough. The Western wood pewee (*Contopus Richardsonii*), which resembles the 'wood pewee' except in being darker and in having shorter legs, longer wings, and larger feet, is found from the sixtieth parallel of latitude to Panama and from the great plains to the Pacific.

The least pewee (*Empidonax minimus*) is a small bird, present in every village garden and roadside, and the type of a genus containing several small similar species. It makes a neat nest of hempen materials placed in the crotch of a small tree. Consult general works on American ornithology. See Plate of Typical Flycatchers with the article Flycatcher; and Colored Plate of Eggs of American Song-Birds.

PEWIT. A British name for several birds having a cry more or less resembling these syllables, especially the lapwing and certain gulls.

PEWTER (OF. *peutre, peautre, piautre*, Fr. *peautre*, probably a variant of OF. *espeautre*, pewter, from LGer. *spialter*, Eng. *spelter*, zinc). An alloy of tin and lead, of which there are principally three varieties: *Ley* or *common pewter*, consisting of tin, 4 parts, and lead, 1 part; *plate pewter*, consisting of tin, 90 parts, antimony, 7, bismuth, 2, and copper, 2; and *trifle pewter*, consisting of tin, 79 parts, antimony, 15, and lead, 6. Pewter is a soft metal, similar in appearance to tin, but somewhat duller and darker in color. It was formerly extensively used for making plates, teapots, and other domestic utensils, but, on account of the poisonous character of the lead, prohibitory measures have been adopted by the governments of several countries, and consequently other alloys have largely taken its place. Old pewter, however, is now highly prized by collectors of antiques. See Alloy.

PEYER'S GLAND. One of the glands forming aggregations of solitary lymphoid follicles, first discovered by Johann Konrad Peyer, principally found in the *ileum*, the lower division of the small intestine, and connected with the function of absorption. (See Digestion.) The solitary glands which are not aggregated have essentially the same structure as those which make up the patches of Peyer, or Peyer's glands.

PEYOTE, pā-yō'tā (Sp., from Aztec *peyotl*, caterpillar, in allusion to the downy growth upon the root of the southern variety). The Mexican name given to several species of plants used by the Indians of the plains and central plateau to produce a peculiar kind of mental exhilaration. The practice existed among the native tribes from the Arkansas River as far south at least as the City of Mexico, and in a few places had crossed the main divide to the Pacific Coast. The southern plant, to which the name was originally applied by the Aztecs, is a species of Compositæ, the active principle being in the root. The variety best known, and the use of which is everywhere found from about the Valley of Mexico northward to the Arkansas, is a small cactus, botani-

eally identified as *Lophophora Williamsii*. The plant grows abundantly in a wild state along the Rio Grande and southward, and is gathered by the Indians, who use either the dried top in its raw state, or the whole plant, sliced, in decoction. It is taken at intervals during a ceremony which lasts throughout the night. The effect is to exhilarate and intensify the imaginative faculties, producing a pleasant dreaminess, without, however, overmastering the will power or producing a disagreeable reaction later. The Indians regard it as the embodiment of a vegetable god, and prize it, aside from its regular ceremonial purpose, as a specific in numerous diseases and ailments, particularly in the relief of fevers and hemorrhages. Certain prepared forms have been put upon the market by a leading drug manufacturer.

PEYRÈRE, pā'rār'. Isaac de la. See Preadamites.

PEYRON, pā'rōn'. Vittore Amadeo (1785-1870). An Italian philologist, born at Turin. He studied under the Abbé Valpergo di Caluso, and in 1815 succeeded him as professor of Oriental languages at Turin. He translated Thucydides into Italian, edited *Fragmenta Ciceronis Orationum* (1824) and other classical texts, and was a member both of the Turin Academy of Sciences and of the French Institute. It was he who first placed the study of Coptic upon a scientific basis by the *Lexicon Linguæ Copticæ* (1835; new ed. 1896), with the supplemental *Grammatica Linguæ Copticæ* (1841).

PEYRONNET, pā'rō'nā'. Charles Ignace, Count (1778-1854). A French politician, born at Bordeaux. As an advocate in his native town he displayed great zeal for the cause of the Bourbons during the decline of Napoleon's power. In 1815 he was made president of the Court of First Instance at Bordeaux and later became Procurator-General at Bourges. In 1821 he was elected to the Chamber of Deputies and in the same year was named Minister of Justice—a post which he held till 1828. He was one of the most prominent champions of reaction during this period, his term of office being marked by the enactment of a rigorous press law (1822), the passage of the iniquitous law against sacrilege (1825), and the reëstablishment of the censorship. In May, 1830, he became Minister of the Interior under Polignac and in that capacity signed the famous Ordinances which brought about the July Revolution (q.v.). Peyronnet fled, but was arrested at Tours and condemned to imprisonment for life on the charge of treason. He was pardoned in 1836. During his captivity he wrote *Pensées d'un prisonnier* (1834) and *Histoire des Francs* (1835).

PÉZENAS, pāz'nâs'. A town in the Department of Hérault, France, on the Hérault, 25 miles west-southwest of Montpellier (Map: France, K 8). It manufactures spirits, wine, and cognac, and the prices which prevail at its weekly market of these articles are registered throughout Europe. Population, in 1901, 7073.

PEZZA, pād'zâ. Michele. The real name of the Italian brigand commonly known as Fra Diavolo (q.v.).

PFÄFERS, pfā'fērs, or **PFEFFERS.** A village in the Canton of Saint Gall, Switzerland, situated near the Tamina River about 2½ miles southwest of Ragatz (Map: Switzerland, D 1). It is noted for its hot springs, which rise a short distance from the village in the gorge of the Tamina. The water, varying in temperature from 99° to 102° F. and containing in small proportions carbonate of lime, chloride of sodium, and magnesia, is used for bathing, and has considerable curative qualities. The springs of Pfäfers were known as early as the thirteenth century, and the present Kurhaus was erected at the beginning of the eighteenth century to replace the older buildings dating from the fifteenth and seventeenth centuries. The baths belonged formerly to the Benedictine monks and were acquired by the canton in 1838. The permanent population of the village is about 600.

PFAFF, pfäf. Johann Friedrich (1765-1825). A German mathematician, born at Stuttgart. In 1788 he became professor of mathematics in Helmstedt, and in 1810 at Halle. He invented a method of integrating partial differential equations of the first order in any number of variables, which depends on the solution of the general problem of integrating a linear homogeneous equation between the differentials. Equations of this kind are therefore called Pfaffian equations and their integration is called the Pfaffian problem.

A determinant,

$$\begin{vmatrix} a_{11} & a_{12} \ldots\ldots\ldots\ldots a_{1n} \\ a_{21} & a_{22} \ldots\ldots\ldots\ldots a_{2n} \\ a_{n1} & a_{n2} \ldots\ldots\ldots\ldots a_{nn} \end{vmatrix}$$

in which $a_{ij} = -a_{ji}$, is called a *gauche*, or *skew* determinant; if in addition, $a_{11} = a_{22} \ldots a_{nn} = 0$, it is called *gauche* and *skew-symmetric*. Every such determinant of even order is the square of an integral function of its elements, which function is called a Pfaffian, it having first been discussed by Pfaff. His chief mathematical works are: *Commentatio de Orbibus et Occasibus Siderum apud Auctores Classicos Commemoratis* (1786); *Versuch einer neuen Summationsmethode* (1788); *Disquisitiones Analyticæ* (1797); *Methodus Generalis Æquationes Differentiarum Particularum Completi Integrandi* (Proceedings of the Berlin Academy, 1814-1815). His correspondence with Duke Karl of Württemberg, Bouterwek, and others was published in Leipzig, 1853.

PFANNSCHMIDT, pfän'shmit. Karl Gottfried (1819-87). A German painter, born at Mühlhausen, Thuringia. He studied painting in Berlin under Däge and under Cornelius in Munich. In 1844 he made his first trip to Italy, where he became an ardent follower of the mediæval as opposed to the Renaissance school. Many of his pictures are church decorations, and almost all are of biblical subjects. His easel pictures include a "Charity" and a "Supper," both in the Berlin National Gallery, as are the cycles from Genesis and Daniel, and that on the Lord's Prayer. His other work includes windows in the Nicholas Church, Berlin; in the cathedral at Magdeburg, and in the Stuttgart garrison church. Pfannschmidt was long professor in the Berlin Academy.

PFAU, pfou. Ludwig (1821-94). A German lyrist and art critic, born in Heilbronn. He studied in the universities of Tübingen and Heidelberg, edited the satirical *Eulenspiegel*, and took a prominent part in the revolt of Baden in 1848.

On the occasion of the revolt, Pfau was sentenced to twenty-two years' imprisonment, but he escaped to Switzerland, and after spending two years in Zurich and in Bern, settled in Paris. In 1863 he returned to Stuttgart and became editor of the *Beobachter*. His poetry is especially valuable for its political satire; *Gedichte* (1846; 4th ed. 1880) and *Deutsche Sonette auf das Jahr 1850* (1849) are the most important titles. Pfau translated many French novels, and with Hartmann a volume of Breton folk-songs (1859). But his original literary work was in art criticism as author of *Freie Studien* (1866), *Kunst und Gewerbestudien* (1877), and *Kunst und Kritik* (1888).

PFEFFEL, pfĕf'fĕl, Gottlieb Konrad (1736-1809). A German fabulist. He was born at Kolmar, and studied at Halle, where he could not finish his course because of threatening blindness. At twenty-two he lost his sight entirely. In 1773, with the help of his wife and the patronage of Louis XV., he founded a school for Protestants which enjoyed great success down to the Revolution. Pfeffel was employed in the council which undertook the reformation of the French educational system. His *Fabeln* (1783) follow Gellert for the most part; his complete works, including several very popular poems, were published at Tübingen (1810-12). Consult his biography by Lina Beck Bernard (Lausanne, 1866), and Stöber, *Pfeffels Verdienste um Erziehung und Schule* (Strassburg, 1878).

PFEFFER, pfĕf'fĕr, Wilhelm (1845—). A German botanist. He was born near Cassel, studied at Göttingen, Marburg, Würzburg, and Berlin, and became professor of botany at Bonn (1873), at Basel (1877), at Tübingen (1878), and in Leipzig (1887). His earlier botanical research was on the geographical distribution of the large-leaved mosses; afterwards he devoted himself to physiological botany. Pfeffer wrote: *Pflanzengeographische Studien aus den Rätischen Alpen* (1869); *Pflanzenphysiologie* (1882, 1897); *Ueber chemotaktische Bewegungen von Bakterien* (1888); *Beiträge zur Kenntnis der Oxydationsvorgänge in lebenden Zellen* (1889); *Physiologie und Pflanzenbau* (1890); *Energetik der Pflanzen* (1892); and contributions to the *Jahrbuch für wissenschaftliche Botanik* (1894 sqq.).

PFEFFERS, pfĕf'fĕrs. A village in Switzerland. See Pfäfers.

PFEIFFER, pfīf'fĕr, Franz (1815-68). A Germanic scholar. He was born at Bettlach, Switzerland, studied at Munich, became royal librarian at Stuttgart in 1846, and in 1857 was made professor of German literature in the University of Vienna. He was one of the most important Germanists of recent times. He founded the review *Germania*, and the series *Deutsche Klassiker des Mittelalters*, for which he edited *Walther von der Vogelweide* (6th ed. 1880). His more valuable works are: *Der Dichter des Nibelungenlieds* (1862), *Freie Forschung* (1867), and, among many editions, *Barlaam und Josaphat* (1843), *Die deutschen Mystiker des 14. Jahrhunderts* (1845-47), and an edition of the *Deutsche Ordenschronik* of Jeroschin (1854).

PFEIFFER, Ida (1797-1858). An Austrian traveler. She was born at Vienna, and began her career as a traveler by a trip to Palestine and Egypt when she was forty-five years old. This expedition was succeeded by others to Scandinavia and Iceland in 1845, and in 1846-48 to Brazil, Chile, China, India, Persia, Armenia, and the Caucasus. Another journey was taken, in 1851-55, to Africa, Australia, and America, resulting in some valuable acquisitions for the Museum of Natural History at Vienna. In 1856 she set out for Madagascar, where she was imprisoned. Broken in health, she returned thence to die. Her works, which have been translated into English, include *Journey of a Viennese to the Holy Land* (1843); *Journey to the Scandinavian North* (1846); and *A Woman's Journey Round the World* (1850).

PFEIL, pfīl, Joachim Friedrich, Count (1857—). A German explorer and colonist in Africa and New Guinea. He was born at Neurode, in Silesia, studied at the gymnasium of Göttingen, and in 1873 went to Natal. He learned the vernacular and stayed in the country four years; then (1879), after a visit to Europe, he settled in Orange Free State and with Wilson mapped the course of the Limpopo; but illness forced him to return to Germany. In 1884, having entered the employ of the Society for German Colonization, Pfeil went to East Africa with Peters and Jühlke, and in 1886 succeeded the latter as general manager of the company in Somaliland. This post he resigned in 1887, and entered the service of the New Guinea Company. His travels and explorations in the South Seas are described in his *Studien und Beobachtungen in der Südsee* (1899), and he also wrote *Vorschläge zur praktischen Kolonisation in Ostafrika* (1887), and *Zur Frage der Deportation nach den deutschen Kolonien* (1897).

PFEUFER, pfoi'fĕr, Karl von (1806-69). A German physician who introduced the rational method of physical and chemical explanations for physiological or pathological conditions. He was born at Bamberg, and studied medicine at Erlangen and Würzburg. After eight years of practice in Munich, Pfeufer held academic positions in Zurich (1840-44), in Heidelberg (1844-52), and in Munich (1852-69). Besides his great contributions to method, which appeared in the *Zeitschrift für rationelle Medizin* (1844 sqq.), he wrote on cholera, *Zum Schutz wider die Cholera* (1849; 3d ed. 1854), and introduced public sanitation as a requisite in medical study. Consult Kerschensteiner, *Leben und Wirken des Dr. Karl von Pfeufer* (Augsburg, 1871).

PFISTER, pfis'tĕr, Albrecht (*c.*1420-*c.*1470). A German printer, to whom the discovery of the art is sometimes wrongly attributed. It seems probable that he worked as wood engraver for Gutenberg. About 1455 he founded a press in Bamberg. There he printed Boner's *Edelstein* (1461); the *Book of the Four Histories* (Joseph, Daniel, Esther, and Ruth) (*c.*1462); the famous *Biblia Pauperum* (1462); and *Belial* of the same date. Consult: Hellels, *Gutenberg: Was He the Inventor of Printing?* (London, 1882), and Dziatzko, *Gutenberg's früheste Druckerpraxis* (Berlin, 1890).

PFIZER, pfit'sĕr, Gustav (1807-90). A German lyrist and critic of the Swabian school. He was born in Stuttgart, studied at Tübingen, and in 1846 became professor at the gymnasium in his native city. He wrote *Gedichte* (1831), *Dichtungen epischer und episch-lyrischer Gattung* (1840),

and *Der Welsche und der Deutsche* (1844); translations of Bulwer and Byron; the critical work *Uhland und Rückert* (1837), and an attack on Heine which called out the *Schwabenspiegel*. His poetry is more original and reflective than most of the products of the Swabian school.

PFLEIDERER, pflī'dēr-ēr. Otto (1839—). A German Protestant theologian, born at Stetten, near Cannstatt. He studied theology at Tübingen and for some time was superintendent and professor at Jena. In 1875 he was called to the chair of systematic theology at the University of Berlin. Through his writings and his lectures, he became known as one of the most influential representatives of liberal theology. His lectures in London (1885) and in Edinburgh (1894) were afterwards published in English: *Lectures on the Influence of the Apostle Paul on the Development of Christianity* and *The Philosophy and Development of Religion* (1894). His principal works are: *Die Religion, ihr Wesen und ihre Geschichte* (1869-78); *Religionsphilosophie auf geschichtlicher Grundlage* (1878-93); *Zur religiösen Verständigung* (lectures, 1879); and *Geschichte der Religionsphilosophie von Spinoza bis auf die Gegenwart* (1893).

PFLÜGER, pflü'gēr. Eduard Friedrich Wilhelm (1829—). A German physiologist, born at Hanau. He studied at Marburg and Berlin, and in 1859 became director of the Physiological Institute and professor in the University of Bonn. Pflüger made special studies on the nervous systems of lower animals; founded in 1868 the *Archiv für die gesamte Physiologie;* and wrote *Sensorische Funktionen des Rückenmarks der Wirbeltiere* (1853), *Physiologie des Elektrotonus* (1859), *Untersuchungen aus dem physiologischen Laboratorium zu Bonn* (1865), and *Ueber die Kunst der Verlängerung des Lebens* (1890).

PFLUGK-HARTTUNG, pflōōk'-härt'tung, Julius von (1848—). A German historian, best known as an authority on Papal and mediæval history. He was born at Warnikow, studied at Bonn, Berlin, and Göttingen, and in 1886 became professor of history at Basel. Thence he went to Berlin, where in 1893 he became head of the Secret State Archives. He wrote *Studien zur Geschichte Konrads II.* (1876-77); *Norwegen und die deutschen Seestädte* (1887); *Acta Pontificorum Romanorum Inedita, 748-1198* (1879-88); *Iter Italicum* (1883); in Grote's *Allgemeine Weltgeschichte* the part on the early Middle Ages (1889); *Krieg und Sieg, 1870-71*, the first of his studies of modern history (1895); *Napoleon I., Republik und Kaisertum* (1900); and *Die Bullen der Päpste bis zum Ende des 12. Jahrhunderts* (1901).

PFORZHEIM, pfôrts'hīm. A town of Baden, Germany, on the northern border of the Black Forest, 16 miles southeast of Karlsruhe (Map: Germany, C 4). It has the remains of an ancient castle, formerly the residence of the margraves of Baden-Durlach, several churches, a convent, and industrial and other schools. The Schlosskirche is a notable old structure in the Gothic and Renaissance styles. Pforzheim is one of the largest manufacturing centres of cheap jewelry in the world, over 10,000 workmen being employed. There are also chemical and iron works, machine shops, tanneries, and paper, electrical apparatus, and other factories. Population, in 1895, 33,331; in 1900, 43,097.

PFUHL, pfōōl, Johannes (1846—). A German sculptor, born in Löwenberg, Silesia. He studied in the Berlin Academy of Fine Arts under Schievelbein, became his master's assistant and completed his plans for the bronze memorial now in the Dönhoffsplatz, Berlin. Soon after Schievelbein's death Pfuhl settled in Charlottenburg. He made a few portrait busts, but his more typical products are colossal groups or reliefs, including a frieze in rilievo, commemorating the Franco-Prussian War, for the military school of Lichterfelde (1876); a statue of Count Stolberg, in Landeshut, Silesia; "Perseus Liberating Andromeda," a fountain decoration in Posen, and also in the Goethe Theatre in Charlottenburg (1884); "Theseus, Hippodameia, and Eurytion" (1886); an equestrian statue of William I. with Bismarck and Von Moltke, in Görlitz (1893); and the Laube monument at Sprottau (1895).

PHA'COPS (Neo-Lat., from Gk. *φακός, phakos*, lentil — *ὤψ, ōps*, eye, face). A genus of trilobites that furnishes several index fossils for the middle Paleozoic formations. The carapace is of oblong or elliptical form and is quite convex, with a pronounced axis, and 11 thoracic segments. The head is semicircular, with its central portion or glabella large and very wide in front. The eyes are large and conspicuous, and the lateral slopes of the head are steep, with their posterior corners rounded. The pygidium or tail piece is large, convex, and strongly ribbed. The genus Phacops ranges from Silurian to Upper Devonian formations. The early European authors generally include under this generic term a number of species that are now classed under the genera Dalmanites, Pterygometopus, Acaste, and others. The most important species are *Phacops logani* of the American Lower Helderberg, *Phacops latifrons* of the European Devonian, and *Phacops rana*, a well-known species of the American Devonian. See Trilobita.

PHÆA'CIA (Lat., from Gk. Φαιακία, *Phaiakiē*). The country of the Phæacians, a people whom Odysseus visited in his wanderings. It was situated on the mythical island of Scheria, identified with Corcyra (Corfu), where the people had settled after having been driven out of their earlier home in Hyperia by the Cyclopes. There they led an undisturbed life of happiness, occupied with their marvelous ships, which safely traversed the sea without human guidance. Odysseus was found on the shore of the island by the Princess Nausicaa, and hospitably received at the palace of her father, King Alcinous. The episode is described in the sixth, seventh, and eighth books of the *Odyssey*.

PHÆ'DO (Lat., from Gk. Φαίδων, *Phaidōn*) (early fourth century B.C.). A Greek philosopher, born in Elis. He was taken prisoner and brought to Athens, apparently about 400 B.C.; there he became acquainted with Socrates, who secured his ransom by one of his friends. He remained a devoted disciple of the great teacher until the latter's death, when he returned to Elis and became the founder of the Elean School (q.v.). He composed dialogues, no longer extant, in the Socratic manner. Plato's dialogue which describes the death of Socrates bears Phædo's name.

PHÆ'DRA (Lat., from Gk. Φαίδρα, *Phaidra*). In Greek legend, the daughter of Minos, King of

Crete, and of Pasiphaë, sister of Ariadne and wife of Theseus. Aphrodite, enraged against Hippolytus (q.v.), Phædra's stepson, for neglecting her worship, and against Phædra, as being the daughter of Pasiphaë, inspired the latter with a passion for Hippolytus. On the rejection of her advances, she falsely accused the youth to Theseus, who prayed to his father, Poseidon, to destroy his son. Hippolytus was thrown from his chariot on the seashore and dragged upon the sands till dead. Phædra died by her own hand and Theseus learned the truth too late. This story, which seems to have been developed from the songs of Trœzenian maidens to their local divinity, Hippolytus, guardian of purity, was first treated in tragedy by Euripides, whose second version has been preserved. It was also treated in a lost play by Sophocles. The Greek tragedy was imitated by the Roman Seneca, and also by Racine, whose *Phèdre* (1677) is one of his masterpieces. Consult Euripides, *Hippolytos*, ed. U. von Wilamowitz-Moellendorff (Berlin, 1891).

PHÆ'DRUS. A Latin fabulist. He was probably a Thracian, who was carried to Rome as a slave in his childhood, and brought up at the Court of Augustus, who emancipated him. Under Tiberius he was exposed to great danger from the hostility of Sejanus, but lived to see that favorite's overthrow, and died at an advanced age, probably in the reign of Claudius. Five books of fables, after the manner of Æsop, and called *Fabulæ Æsopiæ*, have been ascribed to him. Most of the fables are versifications of those of the Æsopian cycle, but many are drawn from contemporary story. The style is good, and the metre is careful. The book, as we have it, is a later and incomplete recension. The first edition was published at Troyes in 1596. The best later editions are those of Müller (Leipzig, 1877, with critical notes), Ramavino (Turin, 1881), and Müller (Leipzig, 1890). See Hervieux, *Les fabulistes latins* (Paris, 1893-96); Bédier, *Les fabliaux* (Paris, 1893). See Æsop.

PHÆDRUS. A dialogue of Plato, in which he is represented walking in the woods with Phædrus, and discoursing on the nature of love. The dialogue is distinguished by unusual poetic enthusiasm. The latter portion is an exposition of dialectics.

PHÆOPHY'CEÆ (Neo-Lat. nom. pl., from Gk. *phaiós*, *phaios*, dusky = *phôkos*, *phykos*, seaweed), or BROWN ALGÆ. A group of algæ named from the color of the chromoplast, always a shade of brown, a color due to the pigment phycophæin, which modifies or overpowers the green of the chlorophyll. In some respects the most remarkable of the four great groups of algæ, comprising the largest and most vegetatively complex forms.

The Phæophyceæ are characteristically inhabitants of the colder waters of the globe, and are almost all marine, reaching their maximum development in Arctic and Antarctic oceans, and along such coasts as the Californian seaboard, where the water for the most part is cold. The display is especially luxuriant at Cape Horn, and on the rocky coasts of the North Atlantic and Pacific oceans. The brown algæ contain a large number of diverse groups, whose representatives range from microscopic forms and delicate filamentous types (Ectocarpales) to the immense coarse kelps several hundred feet long. The Laminariales (kelps, devil's aprons) generally have a stalk (stipe) attached to the rocks by a cluster of strong root-like processes (holdfast), that ends in an expansion called the blade, which in some forms bears lateral leaf-like structures. The blade is simple in the smaller forms (Laminaria), or perhaps split up longitudinally into segments. In many types the blade is cast off at certain periods by the development of a new one through the activity of the tissues just below the old. In other genera the blade serves as the growing region of the plant, and splits off segments which take a lateral position on the stem (Macrocystis).

The most interesting forms on the American coast are the giant kelps of the Pacific Ocean. Macrocystis is reported to attain a length of 900 feet. It is easily recognized by the leaves borne on a stem about the size of a clothes line. Far

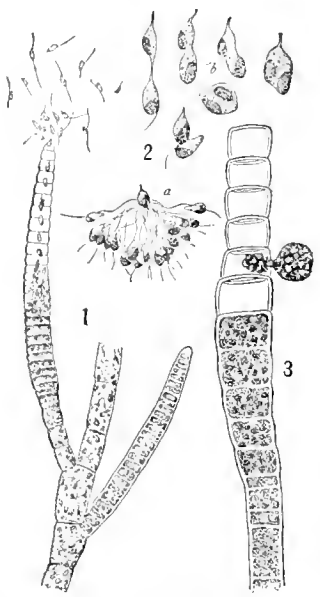


FIG. 1. BROWN ALGÆ.

1, Ectocarpus, with gametes escaping; 2, conjugation of the same, showing (*a*) numerous male gametes about a single female gamete, and (*b*) various stages of fusion; 3, Pylaiella, with one cell functioning as a sporangium.

more picturesque is the sea-otter's cabbage (Nereocystis), which consists of a flexible leafless stalk swollen at the end into a hollow spherical float several inches in diameter. The top of the float bears long strap-like leaves that extend on either side in the water, and are whipped about by the wind and surf. Another interesting form is the sea-palm (Postelsia), which grows on surf-beaten rocks and reefs, and has a heavy, thick, erect stalk 12 to 18 inches high, with a thick crown of leaves that grow out and bend downward in the form of the conventional palm tree. The stalk is so tough that it may be bent over at right angles by the force of the waves without breaking. Lessonia, found on the coast of Chile, has stalks so heavy and thick that they have been mistaken for tree trunks when washed up on the beach. The kelps are one of the principal sources of iodine, which

is obtained from their ashes. They are also used in enriching farm lands along the coast.

In a very different division of the Phæophyceæ

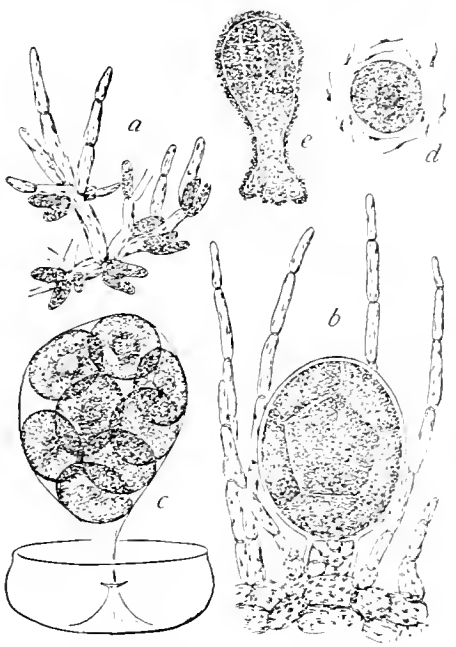


FIG. 2. ROCKWEED (*Fucus*).

a, branches bearing antheridia; *b*, oögonium with paraphyses; *c*, eggs escaping from oögonium; *d*, egg surrounded by sperms; *e*, germination of a fertilized egg.

are the 'rockweeds' and 'gulfweeds.' The former, also called 'wrack' and 'bladder-wrack,' cover the rocks between tide marks with thick fringing growth. Most of the rockweed is Fucus, a form with a forkingly branched thallus, that bears swollen tips, and in some species special air bladders that serve to float the branches. The gulfweeds (Sargassum) have one of the most highly differentiated vegetative bodies among the algæ. The species are found in warmer waters than most brown algæ. In addition to the holdfast and branching stalk, there are delicate leaves and small berry-like air bladders on short pedicels, besides specialized portions that bear sexual organs. Certain species (as Sargassum bacciferum) will vegetate luxuriantly when floating in mideocean, thus forming the large masses of gulfweed met by ships, especially in certain warmer parts of the Atlantic.

Reproduction among Phæophyceæ is either sexual or non-sexual. In non-sexual reproduction motile spores (zoöspores) are formed by the division of the protoplasm of a cell and the escape of the organized parts into the water (Fig. 1, 3). Sexual reproduction is either isogamous or heterogamous. In isogamous union sex cells (gametes), in form and origin like zoöspores, fuse in pairs. Sometimes in behavior they can be distinguished as male and female, as in Ectocarpus (Fig. 1, 2, *a*, *b*). Heterogamous reproduction may be illustrated by Fucus. The eggs, eight in number (Fig. 2, *b*), are formed in a specialized oögonium, which develops in a pit on the surface of a swollen branch, called a conceptacle. They escape into the water, where they are met by biciliate sperms (*d*) which have been produced in numbers in special cells of the branched hairs arising in similar pits. Fertilization occurs by the union of sperm and egg. The latter then grows at once into a new rockweed, its base developing into a holdfast and its apex into a thallus (*e*).

The most comprehensive treatment of the group is in Engler and Prantl, *Die natürlichen Pflanzenfamilien* (Leipzig, 1887—); Murray, *Introduction to the Study of Seaweeds* (New York and London, 1895). See ALGÆ.

PHAER, fā'ẽr, or **PHAYER**, THOMAS (1510?-1560). An English translator, educated at Oxford and at Lincoln's Inn. As a lawyer he aimed to popularize legal methods. To this end he wrote two legal handbooks. Rewarded for his service by the appointment as solicitor in the court of the Welsh marches, he settled at Kilgerran, in Pembrokeshire, where he passed most of his life. He also studied medicine, and published a popular book called *The Regiment of Life*, containing a treatise on the plague (1546). To the *Mirror of Magistrates* (1559) he contributed a poem on a legend connected with Owen Glendower. Phaer is now remembered chiefly for his translation of Vergil's *Æneid* into English ballad metre (7 books, 1555-58; two more books, published posthumously with the first seven, 1562). The translation was completed by Thomas Twine in 1584. Vergil had been translated earlier into the Scotch dialect by Gawin Douglas (q.v.), and the Earl of Surrey (q.v.) had completed two books.

PHA'ËTHON (Lat., from Gk. *φαέθων*, shining). In the Greek poets, a not infrequent title of Helios, the sun-god. Phaëthon, in Greek legend, is also a son of Helios and the Oceanid Clymene. To prove his descent, he went to his father's palace and insisted on attempting to drive the chariot of the sun. Unable to control the fiery horses, he was carried from his course, and, approaching too near the earth, wrought great damage. Whereupon the earth cried to Zeus for help, who struck down Phaëthon with a thunderbolt into the Eridanus, a mythical river, later identified with the Po. His sisters, the Heliades, found the body, and bewailed the loss until they were changed to poplars and their tears to amber, to which the rays of the sun gave its special glow. In the lost *Phaethon* of Euripides the youth appeared as the favorite of Aphrodite, who had placed him in charge of her temple. Consult Knaack, *Quæstiones Phaethonteæ* (Berlin, 1885).

PHAETON. A form of carriage for pleasure-driving drawn by one or two horses. The term is more often applied to a low easy carriage driven by ladies and known as a pony phaeton, although there are the mail phaeton and the spider phaeton, which are high carriages suitable for park driving, with a seat in front for the driver and a companion, and a rear seat for a groom.

PHAËTON. See TROPIC-BIRD.

PHAGEDENA, fāj'ẽ-dẽ'nà (ML., from Lat. *phagedæna*, from Gk. *φαγέδαινα*, *phagedaina*, cancer, from *φαγεῖν*, *phagein*, to eat). A term used in surgery to designate any obstinate and rapidly destructive form of ulceration. The process usually occurs in those whose systems are exhausted by disease and whose vitality is lowered by un-

hygienic surroundings. When an ulcer assumes a phagedenic character it enlarges rapidly: its edges are ragged and thin: its base is covered with an unhealthy slough: the discharge is thin, reddish, and offensive, and around the whole is a zone of red and deeply congested tissue. There is no tendency toward healing. The treatment consists in the local application of caustics or excision, and the administration of stimulants, tonics, and nutritious food, together with measures to promote the most favorable hygienic conditions.

Phagedena gangrænosa is a term sometimes applied to 'hospital gangrene,' a disease which formerly prevailed in prisons and hospitals, but which, owing to sanitary reform and the introduction of antiseptic measures, is now practically extinct.

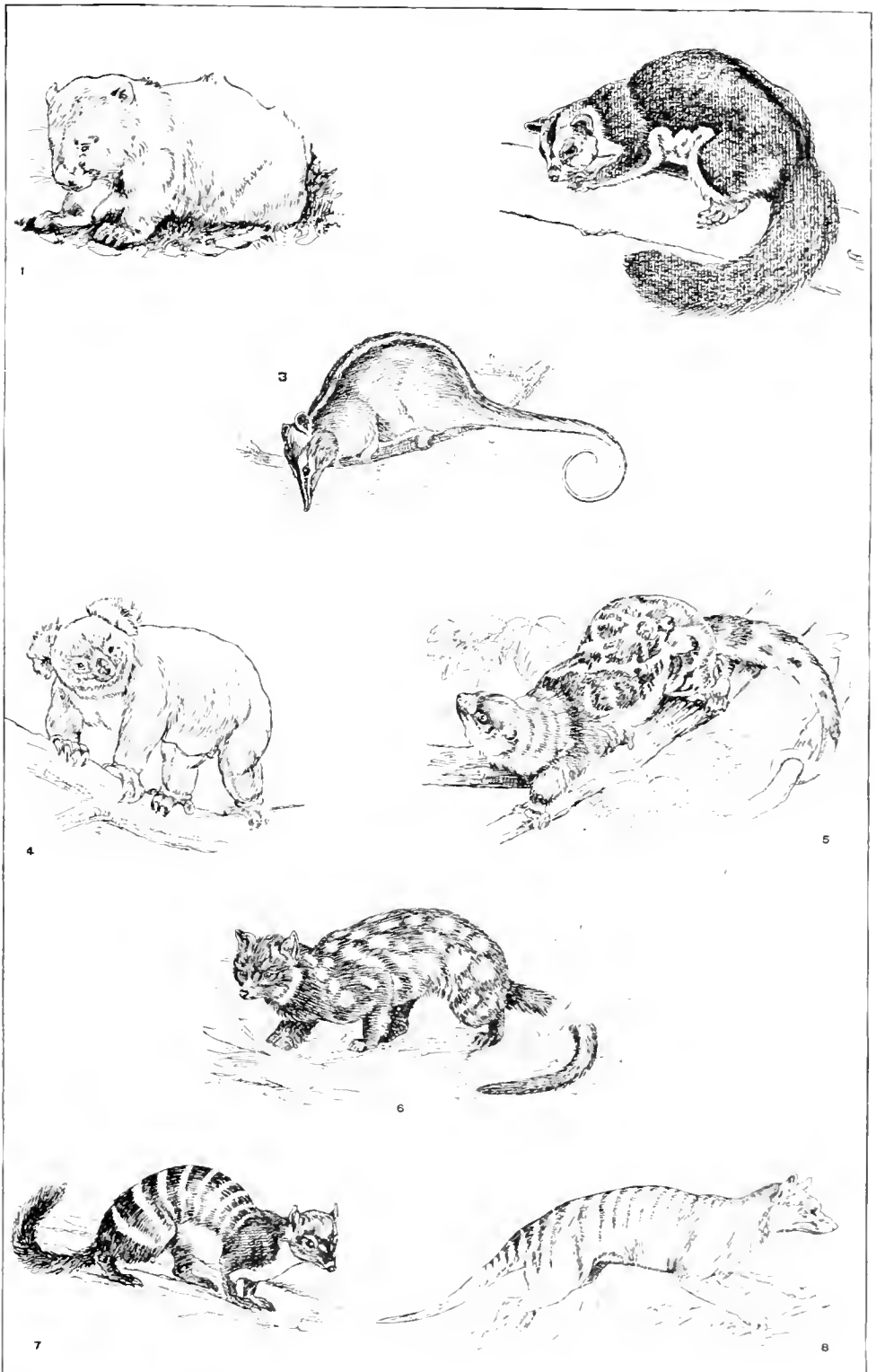
PHAGOCYTE (from Gk. *φαγεῖν*, *phagein*, to eat + *κύτος*, *kytos*, hollow, cell). A microbe-destroying cell residing free in the animal system. About 1883 Metchnikoff found that the individual cells of the stomachs of sponges took in solid particles of food and digested them, and this he called intracellular digestion. This function is performed by individual, free, or 'wandering' mesoderm cells, resembling amœbæ. Such wandering cells, in the cases of many of the lower animals, ingest or absorb parts of the body which become useless or by decay harmful to the organism. Besides this these free amœboid cells can and do capture and devour foreign bodies and particles; they take up anything hard or soft which occurs in or is carried into the body; and when such cells are confronted with a large mass of food-material, which they cannot devour singly, they usually fuse into a plasmodium, which eats up the whole available food. Such bodies as cannot be eaten are surrounded and isolated. Led by these facts, Metchnikoff threw out the remarkable theory that inflammation in the vertebrates is due to the struggle between the white corpuscles of the blood and the disease-germs within it. Thus a new importance was lent to the leucocytes or white amœboid corpuscles, viz. that they act as microbe-eaters or 'phagocytes.' Metchnikoff injected fluids containing bacteria or microbes beneath the skin of various invertebrate animals. They were soon found within the amœboid cells, and if such microbes developed spontaneously in the wounds of such animals, they were absorbed in the same manner. Kovalevsky, a few years later, made similar observations in compound ascidians. When an individual died it was attacked and absorbed by the mantle cells of the colony, which also sought to destroy incoming bacteria, as was proved by experiment. Kovalevsky concluded that the passage of the wandering cells to the surface of the epithelium is a means of protection against the intrusion of agents of disease. These discoveries and theories mark an epoch in biology in its application to medical knowledge.

BIBLIOGRAPHY. Metchnikoff, "Researches on the 'Intracellular Digestion' of Invertebrates," *Quarterly Journal of Microscopical Science*, vol. xxiv. (London, 1884); *Leçons sur la pathologie comparée de l'inflammation, faites à l'Institut Pasteur en avril et mai 1891* (Paris, 1891).

PHAG'OCYTO'SIS. See INFLAMMATION.

PHALANGER (Fr. *phalanger*, from *phalange*, phalanx, from Lat. *phalanx*, from Gk. *φάλαγξ*, line of battle, rank of soldiers, round piece of wood, joint between the fingers and toes). Any of the marsupials of the family Phalangeridæ, which are characterized preëminently by having five fingers and toes, the second and third bound together. The thumb is opposable and nailless. The tail is nearly always long and prehensile. The family is divisible into four sections, and includes a considerable variety of form. Thus the true or typical phalangers include the various species of cuscus (q.v.), and various largish species, some arboreal and some terrestrial, besides the petaurists or flying phalangers (q.v.; also TAGUAN), and the 'dormouse phalangers' of the genus Dromicia. Another group contains the koala (q.v.), a third the wombat (q.v.), a fourth the aberrant little tarsipes of Western Australia, which is only seven inches long, and uses its long, slender tongue to extract honey from flowers, as well as to catch the small insects which constitute most of its food. The phalangers are united with the kangaroos by descent, and are now separated from them only by the musk-kangaroo (Hypsiprymnodon). Typical members of this family are shown in the accompanying plate.

PHALANX (Lat. *phalanx*, from Gk. *φάλαγξ*, line of battle, row of soldiers, round piece of wood, joint between the fingers and toes). The ancient Greek name for the heavy infantry in line of battle. The heavy-armed hoplites were only of service when stationed in a long straight line in close order. In the Homeric poems there are only shadowy traces of a regular line of battle, and the development of the typical Greek formation seems to have been largely the work of the Spartans during their struggles for supremacy in the Peloponnesus. As the principle of formation was the desire to present an equal line to the enemy, the depth and formation depended on circumstances. The usual depth seems to have been eight men, but Miltiades at Marathon weakened his centre in order to extend his line, and at Delium the Theban column was twenty-five deep. It is not until the fourth century B.C. that we find other troops of practical importance in deciding the Greek battles. During that century the improved equipment of the *peltasts*, or light-armed troops, made them able to meet the phalanx, if able to choose their ground and avoid the direct attack. Epaminondas gave a new direction to the art of war by replacing the old attack along the whole line with the decisive onset of one wing, drawn up in a heavy column (at Leuctra fifty deep), while the rest of the line in ordinary depth served to check the enemy. Philip of Macedon learned his military science at Thebes, and reorganized his army by the introduction of a regular infantry besides the hereditary cavalry of the nobles. These soldiers were armed with a small shield, about eighteen inches in diameter, corslets, and long spears, and fought in closer order than was usual among the Greeks. This phalanx seems to have been a mobile body, but probably Philip and certainly Alexander relied rather on the heavy cavalry as the offensive force, and used the phalanx to hold the main line of the enemy in check, while the cavalry crushed his wing or turned his flank. The phalanx of



1. WOMBAT (Phascolomys Mitchelli).
2. FLYING SQUIRREL PHALANGER (Petaurus sciureus).
3. LONG-SNOUTED PHALANGER (Tarsipes rostratus).
4. KOALA (Phascolarctos cinereus).
5. CUSCUS (Phalanger maculatus).
6. COMMON DASYURE (Dasyurus viverrinus).
7. BANDED ANT-EATER (Myrmecobius fasciatus).
8. TASMANIAN WOLF (Thylacinus cynocephalus).

Alexander seems to have had pikes of different lengths, the longest being about seventeen feet, and of course requiring the use of both hands. Though intended to fight in line as a single mass, it was also capable of breaking into small tactical units able to manœuvre separately, if the nature of the ground or the development of the battle made it desirable. The successors of Alexander gradually changed his fundamental principles, and depended again upon the phalanx to decide the day. This led to even closer massing of men and increase of the length of the lances, till the mass became irresistible if unbroken, but unwieldy and utterly helpless if broken by uneven ground, as was proved in many a battle against the Roman legions. This later phalanx was regularly drawn up sixteen men deep, and either about three feet apart, body included, or only about eighteen inches with shields touching; a formation which made any turning on the part of individuals impossible. The lances were about twenty feet long, and those of the first five ranks projected in front; the others held their spears over the shoulders of their comrades, ready to drop them if occasion arose. Consult: Droysen, "Griechische Kriegsalterthümer," in Hermann, *Lehrbuch der griechischen Antiquitäten* (Freiburg, 1888); Bauer, in Müller's *Handbuch der klassischen Altertumswissenschaft*, vol. iv. (Munich, 1893); Delbrück, *Geschichte der Kriegskunst* (Berlin, 1900); Lammert, *Polybios und die römische Taktik* (Leipzig, 1889).

PHAL'ARIS (Lat., from Gk. *Φάλαρις*). A tyrant of Agrigentum in Sicily, whose rule lasted from about 570 to 549 B.C., when he was killed in a popular revolt. He maintained himself by mercenaries, and chiefly by stratagem extended his power on all sides. The tradition, at least as old as Pindar, that he gratified his savage nature by roasting persons alive in a brazen bull, has made him the universal type of the cruel tyrant. A collection of letters which bears his name represents him as a kindly and cultivated prince; but Bentley in his famous *Dissertation* (first published in 1699) showed that these are probably forgeries of the Christian Era. See BENTLEY, RICHARD. Consult: Freeman, *History of Sicily*, (Oxford, 1891).

PHALARIS. See CANARY-GRASS.

PHAL'AROPE (from Gk. *φαλαρίς*, *phalaris*, coot, *πούς*, *pous*, foot). A sandpiper-like shorebird of the family Phalaropodidæ, having lobate feet and a rather long bill, which is slender, weak, and straight. Phalaropes differ from sandpipers, however, in that they spend the greater part of their time in swimming on the sea, where they seek mollusks and other small marine animals for their food. They are very fearless of man and are said to be easily tamable, but the flesh is oily and unpalatable. The phalaropes differ from most other birds in the remarkable relative condition of the two sexes. The females are not only larger and more brightly colored, but they do the courting, and, after they have secured a mate and laid their 3 or 4 eggs, they leave the male to do the incubating. Three species only are known, all inhabitants of the Northern Hemisphere and two circumpolar. Each is now made the type of its own genus. The northern phalarope (*Phalaropus lobatus*) has the membrane of the toes scalloped and the bill very slender. It breeds in the Arctic regions and migrates southward on the approach of winter. The nest is a shallow depression in the ground lined with grass and moss. The eggs are olive-gray or buffy-white, heavily blotched with chocolate-brown. Its entire length is rather less than 8 inches. The tail is short. It is a beautiful bird, and remarkable for the great difference of its summer and winter plumage, the prevailing tint in winter being a delicate gray, while in summer the upper parts exhibit a fine mixture of slate-gray and buff, sides and front of neck rufous, and the breast and under parts are white. The red phalarope (*Crymophilus fulicarius*) is rather larger than the northern phalarope, and is, like it, very graceful in form and movements, and finely colored. The membrane of the toes is scalloped, but the bill is stouter, flattened, and has a lancet-shaped tip. The third species is Wilson's phalarope (*Steganopus tricolor*), which is an American bird, found in summer north to the Saskatchewan, and in winter south to Brazil and Patagonia. It is rare in the East, but abundant in the Mississippi Valley. It is the largest of the three species, being nine inches or more in length. The toe-membranes are plain and unscalloped. Consult: Coues, *Birds of the Northwest* (Washington, 1874). See Plate of EGGS OF WATER AND GAME BIRDS.

PHALLICISM, or PHALLISM (from *phallic*, from Gk. *φαλλικός*, *phallikos*, relating to the male organ, from *φάλλος*, *phallos*, male organ). The worship of the generative power, as expressed most strongly by adoration of the male organ. As a cult, phallicism is typical of the Oriental races, especially Semitic and Dravidian. In Europe its strongest expression is found in Greece, which was under Semitic influence; but as a phase of other worship, rather than as a special cult, it is native to many savage tribes of America and Asia. Under a corresponding name, linga-worship, phallicism is still practiced by the natives of India. There are two forms of phallicism. The lower, and probably earlier, form is found when the phallos itself is worshiped as divine or is regarded as emblematic of sexual passion alone. Ordinarily, in this form, the phallic emblem is the mark of devotion to some deity of lust, who is not necessarily a male divinity. On the contrary, the female deity is more usual and sometimes older than the male. In the latter case we have reverence paid to the divine mothers, or female forms, of India; to the date-palm, mother-goddess in Arabia, etc.; in the former we find the worship of Dionysus in Greece and Siva in India. In this first form of phallicism there is no notion, or only a very vague notion, of affinity between sexual instinct and the creative power of nature. Among savages the rite in this form is scarcely more than a frankly brutal indulgence of passion; in a civilized community, where excess is frowned upon by a more refined sentiment, the indulgence tends to become secret, as in the Tantric worship of India. This Hindu phallicism, with its conventional admixture of philosophy, represents the conditions which obtained in Greece when orgies were veiled as Orphic mysteries.

In the second form the phallos serves merely as a symbol of that mysterious force which in spring renews vegetable life and awakens to fresh energy all living things, and phallicism thus refined becomes the worship of a great divine uni-

fy ... and creative power. Such phallicism as this ... the religion of ascetics, like the Lingaites of India, and in this case the phallic emblem is usually two-fold, as the deity is regarded as androgynous. But the two emblems, no longer realistic, are merely conventionalized shapes, which are placed in the temples of the male-female god Siva. Such was probably the phallicism of the higher minds in Greece, and to them the Orphic mysteries were a philosophical reinterpretation of the naive form of grossly material phallicism which alone appealed to the vulgar.

Phallicism is not necessarily primitive, although found in very savage communities. Among the Central Australians, for example, there are erotic dances, but no trace of phallic worship. Finally it is to be observed that many supposed phallic survivals, such as the *swastikas* (q.v.) and upright stones, may have in reality nothing to do with phallic worship. Phallicism, however, lies at the base of various savage rites in many parts of the world, Asia, Africa, and America, and was often connected, as among the Aztecs, with higher forms of nature-worship. Consult: Tylor, *Primitive Culture* (Boston, 1874); Fergusson, *Rude Stone Monuments* (London, 1872); Barton, *Semitic Origins* (New York, 1901).

PHANARIOTS. See FANARIOTS.

PHAN'EROGAM (from Gk. *φανερός, phaneros*, evident + *γάμος, gamos*, marriage). An old name of spermatophytes (q.v.), popularly called flowering plant. They are also called 'phenogams' or 'phenogans.' See CRYPTOGAMS.

PHAN'EROGLOS'SA (Neo-Lat., from Gk. *φανερός, phaneros*, evident + *γλῶσσα, glōssa*, tongue). A suborder of the Anura (q.v.), containing those frogs and toads which possess a tongue, which has the shape of a round disk adherent by nearly the whole of its base, and is not protrusible. This group includes the great majority of the frogs and toads of the world. Consult Gadow, *Amphibia and Reptiles* (London, 1901).

PHAN'OCLES (Lat., from Gk. *Φανοκλῆς, Phanoklēs*). A Greek elegiac poet of the close of the fourth century B.C. Of his life we know nothing. His poems deal with the loves of the gods for beautiful boys; the tragic vengeance in each case seems to have been particularly stressed. Apart from some merely verbal fragments, there remains of this series only one considerable piece from a poem on Orpheus's admiration for Calaïs, which shows much beauty of diction and versification. It is edited in Bergk's *Anthologia Lyrica*.

PHARAOH. *fā'rō or fā'rā-ō* (Heb. *Par'ōh*, Gk. *Φαραώ, Pharaō*). The Hebrew form of the Egyptian *Per-o*, used in the Bible as the general name or title of the kings of Egypt. From motives of reverence, the Egyptians avoided using the name of their sovereign, and usually substituted for it some such expression as 'the good god,' 'Horus the lord of the palace,' 'his Majesty,' 'the King,' or, especially under the New Empire, the indefinite pronoun 'one.' A very old designation of this nature was *Per-o*, 'great house' (i.e. the palace). It occurs as early as the Fourth Dynasty, was used with special frequency in the vernacular of the New Empire, and finally, at quite a late period, became the common popular designation of the Egyptian monarchs. It is preserved in the Coptic *perro*, 'the King,' where the *p* is mistaken for the definite article. Josephus (*Antiq.*, viii. 6, 2) correctly explains Pharaoh as meaning 'King,' and as late as the fourth century A.D. Horapollo seems to have known that 'great house' was a synonym of 'King.' Consult: Ebers, *Aegypten und die Bücher Moses* (Leipzig, 1868); Cheyne and Black, *Encyclopædia Biblica*, vol. iii. (London, 1889, et seq.).

PHARAOH'S HEN, or PHARAOH'S CHICKEN. The small Egyptian vulture (*Neophron percnopterus*), so called because of its frequent appearance in the ancient hieroglyphs.

PHARAOH'S RAT. The Egyptian mungoos (*Herpestes ichneumon*).

PHARISEES (Heb. *pĕrūshīm*, Aramaic *pĕrīshīn*, the set apart, separatists). A Jewish religious party. The Pharisees first emerged as a definite party when the success of the Maccabean revolt led to the foundation of a secular State, at the head of which John Hyrcanus (high priest, B.C. 135-105) reigned as a secular prince, making alliances with other powers. Opposition to this policy, along the line of the old spirit of separation from all things non-Jewish (see GENTILES), crystallized in the party of the Pharisees. They were essentially a religious party and used political methods only when their principles had been severely outraged or when they could not otherwise attain their ends. Their distinctive doctrines were: (1) Separation from all intercourse in common life with the mass of the people, whom they designated as the *'am hā'āreṣ* (people of the land). This term did not include, as it had originally done, the heathen inhabitants of the land, from whom Jehovah was supposed to have commanded the Israelites to keep apart for fear of contamination (cf. Ezra ix. 1; Neh. x. 28-31); it was used by the Pharisees to designate even their orthodox fellow countrymen who were less scrupulous than themselves in the interpretation and observance of the law. Since absolute separation was impossible, they drew up elaborate rules to govern their intercourse with the mass of their fellow-countrymen. They would not buy or sell in exchange with an *'am hā'āreṣ;* their great Rabbi Hillel said, "No *'am hā'āreṣ* is pious." They worshiped, however, with their countrymen in the temple and synagogue, and Hillel also said, "Separate not thyself from the congregation." Nevertheless the Pharisees stood highest in the popular favor. (2) Less distinctive, but held with equal intensity, was their doctrine of the strict interpretation and rigid observance of the law as a necessity to righteousness. They insisted upon both the written law (the Torah) and also the traditions of the elders. Indeed, they made the tradition of more weight than the law (Mark vii. 8 sqq.). One of their principles was, "It is a greater crime to teach contrary to the precepts of the scribes than contrary to the Torah itself." The law was extended by them to the minute details of the ablution of hands and vessels, to tithes, fasts, and Sabbath observance. They were the strictly legal party; righteousness was the product of legal observance, according to their teaching. (3) They cherished the political ideal of a restoration of the kingdom of Israel, which they expected to be accomplished through the interposition of a divine act; preparation for

this consummation they believed was best achieved through a strict carrying out of the law. Foreign domination they regarded as a punishment of God for the sins of the people. (4) Their other doctrines, regarding the immortality of the soul, providence, and human freedom, were less peculiar and held in common with other Jews.

The Pharisees are most familiar through their relation to Jesus of Nazareth. They became his bitter opponents early in his ministry and continued so until the end. The grounds of their hostility were many. He and his disciples mingled freely with publicans and sinners, thus violating the distinctive Pharisaic doctrine of separation from the *'am hā'āreṣ*. They were careless about the strict observance of fasts, ablutions, and the Sabbath. The teaching of Jesus concerning the Fatherhood of God was in direct opposition to the letter and spirit of Pharisaic legalism. His interpretation of the Torah in the Sermon on the Mount was a repudiation of the Pharisaic principle that righteousness is the result of the strictness with which commandments affecting the external life are observed. The Pharisees made the religious relation one of legal compact; Jesus made it one of personal fellowship in the bond of filial trust and obedience. These two systems were utterly contradictory; the representatives of the one could not endure the teacher of the other. Hence the Pharisees were the most active in putting Jesus to death. After the destruction of Jerusalem under Titus (A.D. 70) the Pharisees survived as a party; their leading rabbis formed a body which regarded itself as the continuation of the ancient Sanhedrin; this group persisted and preserved Judaism of the stricter sort after the theocracy was really overthrown.

BIBLIOGRAPHY. Consult the histories of the Jews, by Ewald, Graetz, Wellhausen, and the lives of Jesus; Geiger, *Sadducäer und Pharisäer* (Breslau, 1863); Cohen, *Les Pharisiens* (Paris, 1877); Wellhausen, *Die Pharisäer und Sadducäer* (Greifswald, 1874); Schürer, *History of the Jewish People in the Time of Jesus Christ* (Edinburgh, 1886-90); Cornill, *History of the People of Israel* (Chicago, 1898); Eaton, article "Pharisees," in the Hastings *Bible Dictionary*, vol. iii. (New York, 1900); Prince, article "Scribes and Pharisees," in *Encyclopædia Biblica*, vol. iv. (London, 1903).

PHARMACEUTICAL ASSOCIATION, AMERICAN. A scientific society with its headquarters at Baltimore, Md. Its initial meeting was held in New York in 1851. The association was organized in Philadelphia in 1852, and incorporated in Washington, D. C., in 1888. Its objects are to improve the science and art of pharmacy by diffusing scientific knowledge among apothecaries and druggists, to foster pharmaceutical literature, to stimulate discovery and invention, and to encourage home production and manufacture in the several lines of drugs. It has published annual volumes of proceedings since 1851, except for the year 1861.

PHARMACOPŒIA (Neo-Lat., from Gk. φαρμακοποια, *pharmakopoiia*, art of preparing drugs, from φαρμακοποιος, *pharmakopoios*, one who prepares drugs, from φαρμακον, *pharmakos*, drug, medicine + ποιειν, *poiein*, to make). A term applied to various works, consisting for the most part of (1) a list of the articles of the materia medica, whether simple or compound, with their characters, and the tests for the determination of their purity; and (2) a collection of approved receipts or prescriptions, together with the processes for articles in the materia medica, obtained by chemical operations. Almost every civilized country of importance has its national pharmacopœia, among which those of the United States, Great Britain, France, and Prussia deserve honorable notice. The first pharmacopœia published under authority appears to have been that of Nuremberg in the year 1542. Valerius Cordus, a student, who was staying for a short time at Nuremberg, showed a collection of medical receipts, which he had selected from the works of the most eminent writers, to the physicians of that city, who were so struck with its value that they urged him to print it for the benefit of the apothecaries, and obtained for his work the sanction of the senatus. Before this time the books chiefly in use among apothecaries were the treatises: *On Simples*, by Avicenna and Serapion; the *Liber Servitoris* of Balchasim ben Aberazerim; the *Antidotarium* of Johannes Damascenus or Mezue, arranged in classes; and the *Antidotarium* of Nicolaus de Salerno, which was arranged alphabetically. This work was commonly called *Nicolaus Magnus*, to distinguish it from an abridgment known as *Nicolaus Parvus*.

The first edition of the London pharmacopœia (or, more correctly speaking, of the pharmacopœia of the London College of Physicians) appeared in 1618, and was chiefly founded on the works of Mezue and Nicolaus de Salerno. Successive editions appeared in 1627, 1635, 1650, 1697, 1721, 1746, 1787, 1809, 1824, 1836, and 1851, and form an important contribution to the history of the progress of pharmacy and therapeutics during the last two centuries and a half.

The Edinburgh pharmacopœia is more modern than the London, the first edition having appeared in 1699, while the Dublin pharmacopœia does not date farther back than 1807. The latest editions of these works appeared in the years 1841 and 1850 respectively.

Until the Medical Act passed in 1858, the right of publishing the pharmacopœia for England, Scotland, and Ireland was vested in the colleges of physicians of London, Edinburgh, and Dublin respectively; and as these three pharmacopœias contained many important preparations, similar in name, but totally different in strength (as, for example, dilute hydrocyanic acid, solution of hydrochlorate of morphia, etc.), dangerous complications arose from a London prescription being made up in Edinburgh or Dublin, or vice versa. By that act is is ordained that "the general (medical) council shall cause to be published, under their direction, a book containing a list of medicines and compounds, and the manner of preparing them, together with the true weights and measures by which they are to be prepared and mixed; and containing such other matter and things relating thereto as the general council shall think fit, to be called *British Pharmacopœia*, which shall for all purposes be deemed to be substituted throughout *Great Britain* and *Ireland* for the several above-mentioned pharmacopœias."

The *British Pharmacopœia*, of which mention has just been made, a work published in 1864, had the merit of amalgamating the London, Edin-

[illegible] pharmacopœias; but it unfortunately contained so many defects that, in accordance with the universal wishes both of the medical profession and of the chemists, the medical council ordered a new edition to be prepared as speedily as possible. This edition appeared in 1867, and has been followed by others in 1874, 1885, and a supplement in 1890. The French pharmacopœia is used in Switzerland also. The Prussian pharmacopœia is used in Germany and Russia. The pharmacopœia of Orosi is used in Italy.

It may be proper here to make the distinction between a pharmacopœia and a dispensatory. These terms have been used indiscriminately, but there is a distinction among pharmacists. A pharmacopœia is strictly a collection of recipes or instructions for making various medicinal compounds, or simple preparations, which are also made under the authority of a college or body of medical men, and are termed 'official'. A dispensatory is a book which also treats of the preparation of medicines; but it moreover contains the natural as well as the medical history of the various medicinal substances. A dispensatory, in addition to official preparations, may contain many others, and be published without official authority. A dispensatory is also to a greater or less extent a treatise on *materia medica* (q.v.), a branch of medical science which treats of the knowledge and action of medicines, and may either treat of the action of individual medicines or embrace the whole range of the pharmacopœia, and occupy itself with the action of every article, simple or compound, either upon a healthy or a diseased subject; that is to say, it may consider the physiological as well as the therapeutic action of medicines, therapeutics (q.v.) being that branch of the science which treats of the action of drugs as *medicines* strictly speaking, or their action in disease; for this is often very different from their action on the healthy body, or their physiological action. A dispensatory is generally a combination of a pharmacopœia, a materia medica, and a treatise on therapeutics, as far as the latter is not included in materia medica.

In many of the countries of Europe the pharmacopœia is published by authority of the Government, and its requirements are enforced by law. In the United States this is not so, but in many of the individual States the "Pharmacopœia of the United States of America" has been adopted as the legal standard. In 1778 the first pharmacopœia in this country was published in Philadelphia for the use of a portion of the American army. Another was published in 1805 for use in New England. The New York Hospital issued one for its own use in 1815; later editions, like those of similar institutions, being known as the Formulary and consisting of classified collections of prescriptions. The New York County and New York Medical Societies in 1818 took measures for holding a convention of delegates from various State medical societies and medical colleges, which met at Washington January 1, 1820. The action taken then resulted in the appearance the same year of the first *Pharmacopœia* in the United States of America, a volume of 272 pages in Latin and English. Since the edition of 1840 the Latin has been [illegible]. The convention made provisions for the [illegible] other conventions for revision every te[illegible] convention of 1860 received delegates from the army and navy, and from various colleges of pharmacy and pharmaceutical societies. Following the convention held at Washington in 1890, the seventh revised edition was published in 1893. The first edition of the *United States Dispensatory* was issued in 1831. It has since that time passed through many revisions, and has become double its original size, till at the present time it is really an encyclopædia of therapeutics, pharmacy, and materia medica. Several other excellent pharmacopœias and dispensatories have been published, the *National Dispensatory* and the *American Dispensatory* being the most prominent. Though valuable, they do not occupy the official position that is filled by the pharmacopœia. New preparations are, of course, continually added to the pharmacopœias.

PHARMACY (OF. *farmacie*, Fr. *pharmacie*, from Gk. φαρμακεία, *pharmakeia*, use of drugs, from φάρμακον, *pharmakon*, drug, medicine). That department of *materia medica* (q.v.) which treats of the collection, preparation, preservation, and dispensing of medicines. It is synonymous with *pharmaceutical chemistry*.

PHAR'NABA'ZUS (Lat., from Gk. Φαρνάβαζος, from OPers. **Farnābazu*, having an arm of glory). A Persian, son of Pharnaces, whom he succeeded, in the reign of Darius II., as satrap of the region Dascylitis, which embraced the coast lands in Northwestern Asia Minor. In B.C. 413 he espoused the cause of the Spartans, with whom he acted in concert for several years, endeavoring to drive the Athenians from the region of the Hellespont. In 408, however, changing his policy, he made a covenant of friendship and hospitality with Alcibiades, and accepted terms of accommodation from the Athenians. In 396 he defeated an invading Spartan force under Agesilaus, but in the next year was himself defeated by that general. Soon after, Conon came to his assistance from Athens, and the two sailed through the Ægean Sea, driving out the Lacedæmonians from the seaport towns. Pharnabazus's final effort was with the Athenian Iphicrates in Egypt in 377 and the following years. The expedition proved unsuccessful.

PHA'ROS (Lat., from Gk. φάρος). A rocky island off the west extremity of the Egyptian coast, opposite the town of Rakotis. When Alexander chose this spot as the site of Alexandria, he connected the island with the mainland by the Heptastadium, or Seven-Furlong Mole. This made it possible to build two harbors, and on the eastern extremity of the island, at the entrance to the great harbor, Ptolemy I. began the erection of a great lighthouse, which was finished under his son, Ptolemy Philadelphus, about B.C. 282. The architect was Sostratus of Cnidus, and the work was reckoned among the wonders of the world. It was a lofty tower with a square base measuring about 100 feet on a side, and the light was furnished by a beacon fire on the summit. The statements that it was 400 feet high and that the light was visible for 60 miles at sea are certainly exaggerations. After standing for nearly 1600 years one side was thrown down by an earthquake on August 7, 1303, and in 1346 it was a complete ruin. In 1478 the foundations were used for the fort Kaït Baï, and the side of the great central tower has the same length as that given for the side of the old Pharos.

PHARSALIA. An epic poem in ten books by Lucan, narrating the struggle between Cæsar and Pompeius. The hero is Cato.

PHARSA'LUS (Lat., from Gk. Φάρσαλος), now PHERSALA. A Greek city of Southern Thessaly, on the river Enipeus, the chief town of the District of Pharsalia. It does not appear in history until the fifth century B.C., and seems to have been one of the prosperous cities of Thessaly. In the fourth century B.C. it was the home of Daochus, who was one of the chief adherents of Philip of Macedon. It is best known from the battle of Pharsalia, fought near the city on August 9, B.C. 48, between Cæsar and Pompeius. Pompeius had about 47,000 legionaries, 7000 cavalry, and a great number of light-armed auxiliaries. Cæsar had 22,000 legionaries, and 1000 German and Gallic cavalry. The battle, which commenced with an attack by Pompeius's cavalry on Cæsar's right wing, ended in the turning of Pompeius's left and the destruction of his army. About 15,000 fell, and the remainder surrendered on the following day. Phersala was one of the positions occupied by the Greeks in the disastrous war against Turkey in 1897, and after the rout of the Greeks was entered by the Turks on May 6th.

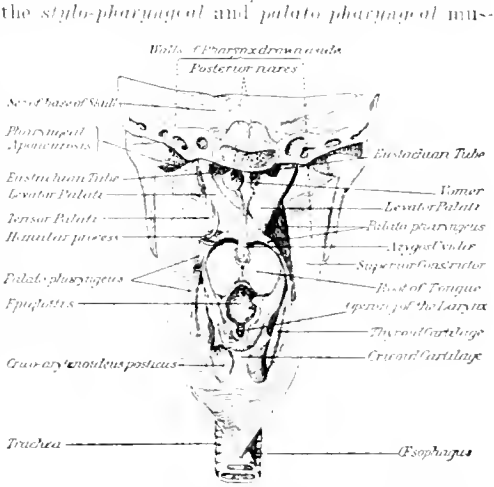
PHARYNGITIS (Neo-Lat., from Gk. φάρυγξ, *pharynx*, throat, pharynx). A disease of the mucous membrane lining the pharynx, accompanied by inflammation. It is generally described as of one of two types: (1) catarrhal; (2) follicular. Catarrhal pharyngitis is the ordinary 'sore throat.' It is characterized by swelling and laxation of the mucous membrane, with redness and tenderness of its surface, and occasionally ulceration with bleeding. Occasionally there is a chill, followed by fever at the invasion of the attack. The follicular variety is characterized by a pebbled surface, the elevations corresponding to the situation of the follicles in the membrane. Either variety may be preceded by a stage during which the mucous membrane is dry and the surface dull and pale. There is also a chronic dry pharyngitis. Pharyngitis is generally caused by inhaling irritating vapors, including tobacco smoke, exposure to chilling wind when perspiring, or by the presence of uric acid in the blood. It is increased by constipation. Internal treatment for pharyngitis includes the administration of aconite, codeine, cubeb, alkalies, sodium salicylate, quinine, and tincture of iron. Local applications include tincture of iron, glycerite of tannic acid, benzoinol, camphor, menthol, and nitrate of silver.

Inflammation of the pharyngeal soft parts around the tonsil, or peritonsillitis, is treated under QUINSY (q.v.).

PHARYNGOG'NATHI (Neo-Lat. nom. pl., from Gk. *φάρυγξ, pharynx*, throat + γνάθος, *gnathos*, jaw). A suborder of acanthopterous fishes, having the lower pharyngeals fully united. It includes the Labridæ, Scaridæ, and allied families. This group has aroused great diversity of opinion among ichthyologists. Consult Jordan and Evermann, *Fishes of North America* (Washington, 1896).

PHARYNX (Neo-Lat., from Gk. φάρυγξ, throat, pharynx; connected with φαραγξ, *pharanx*, cleft, φαρᾶν, *pharan*, to plow). The name of the combined portion of the respiratory and alimentary tracts which lies behind the nose and mouth above and in front, and the larynx and œsophagus below. It is a musculo-membranous sac, situated in front of the cervical portion of the vertebral column, and extending from the base of the occiput to the level of the fifth cervical vertebra, where it becomes continuous with the œsophagus (q.v.). Its length is about four inches and a half; it is broader in its transverse than in its antero-posterior diameter, and its narrowest point is at its termination in the œsophagus. Seven openings communicate with it, viz.: the two *posterior nares* or nostrils, at the upper and front part of the pharynx; the two *Eustachian tubes*, opening on the outer margins of the preceding orifices; the *mouth*; the *larynx*; and the *œsophagus*.

The pharynx is composed of an external *muscular* coat; a middle *fibrous* coat called the *pharyngeal aponeurosis*, thick above where the muscular coat is absent, and gradually thinning as it descends; and a *mucous* coat, continuous with the mucous membrane of the mouth and nostrils. The muscular coat requires special notice. It is composed of a *superior, middle*, and *inferior constrictor* muscle on either side, together with two less important muscles, termed the *stylo-pharyngeal* and *palato pharyngeal* mus-



cles. When the food, after being sufficiently masticated and mixed with saliva, is thrown, by the action of the tongue, into the pharynx, the latter is drawn upward and dilated in different directions; the elevator muscles (the stylo-pharyngeal and palato-pharyngeal) then relax, and the pharynx descends; and as soon as the morsel is fairly within the sphere of action of the constrictor muscles, they successively contract upon it, and gradually pass it onward to the œsophagus. Independently of its importance in the act of swallowing, the pharynx exerts an influence on the modulation of the voice, especially in the production of the higher notes.

The pharynx is subject to various circulatory disturbances, to acute and chronic inflammations, ulceration, suppuration, and abscess. It is the most frequent site of diphtheria. This affection as well as the suppurative processes requires prompt and appropriate medical treatment.

PHASCOLOGALE, fās'kō-lō-gā'lē (Neo-Lat., for **phascologale*, from Gk. φάσκωλος, *phaskōlos*, leathern bag + γαλῆ, *galē*, weasel). A genus of

diminutive. [illegible] dasyures (q.v.), very pretty, and much like mice, except that they live wholly in trees and make their homes in hollows of tree-trunks.

PHASES (ML., nom. pl., from Gk. *φασις*, *phasis*, appearance, from *φάειν*, *phaein*, Skt. *bhā*, to shine). The different luminous appearances presented by the moon and several of the planets, sometimes the whole, a part, or none, of the luminous surface being seen from the earth. (For the various phases of the moon and the seasons for them, see MOON.) Mercury and Venus present to an observer on the earth similar phases to those of the moon; but require, instead of a month, periods of 116 and 584 days, respectively, to pass through a complete series of phases. Since Mars has an orbit exterior to that of the earth, it cannot pass between it and the sun. Consequently, we can never observe a crescent phase of this planet. But when in quadrature (q.v.) it is visibly gibbous, like the moon when about four days from full. The other planets show no observable phases, on account of their great distances from the earth.

PHA'SIS. The ancient name of a river in Transcaucasia, now called the Rion (q.v.).

PHEASANT (AF. *fesant*, *fesaunt*, OF., Fr. *faisan*, from Lat. *phasianus*, from Gk. *φασιανός*, pheasant, Φασιανός, relating to the Phasis, from Φᾶσις, *Phasis*, name of a river in Colchis, where the birds are said to have abounded). A large group of handsome gallinaceous birds of the family Phasianidæ, and especially of the subfamily Phasianinæ. They have the cheeks and skin around the eyes destitute of feathers; the wings short, and the tail usually more or less elongated; and the feet of the cocks spurred. The males are always birds of splendid plumage, while the females are generally quite inconspicuous. The name pheasant was first applied to the bird now so extensively naturalized in Western Europe, and came from the Phasis River, on whose banks the birds are said to have been very abundant, and whence they were first brought to Europe before the fourteenth century. It is now the standard game-bird of Great Britain, and bred and 'preserved' for the annual shooting season in enormous numbers. The plumage of the common pheasant (*Phasianus Colchicus*) is very handsome. The head and neck of the cock are steel blue, reflecting brown, green, and purple tints in different lights; the back and wings exhibit a fine mixture of orange-red, black, brown, and light yellow; the breast and belly are golden red, each feather margined with black, and reflecting tints of gold and purple. The whole length of a male pheasant is about three feet, of which the tail often measures two feet. The entire length of the female is about two feet, and the general color is pale yellowish brown, varied with darker brown, the sides of the neck tinged with red and green. See Colored Plate of GAME BIRDS, under GROUSE.

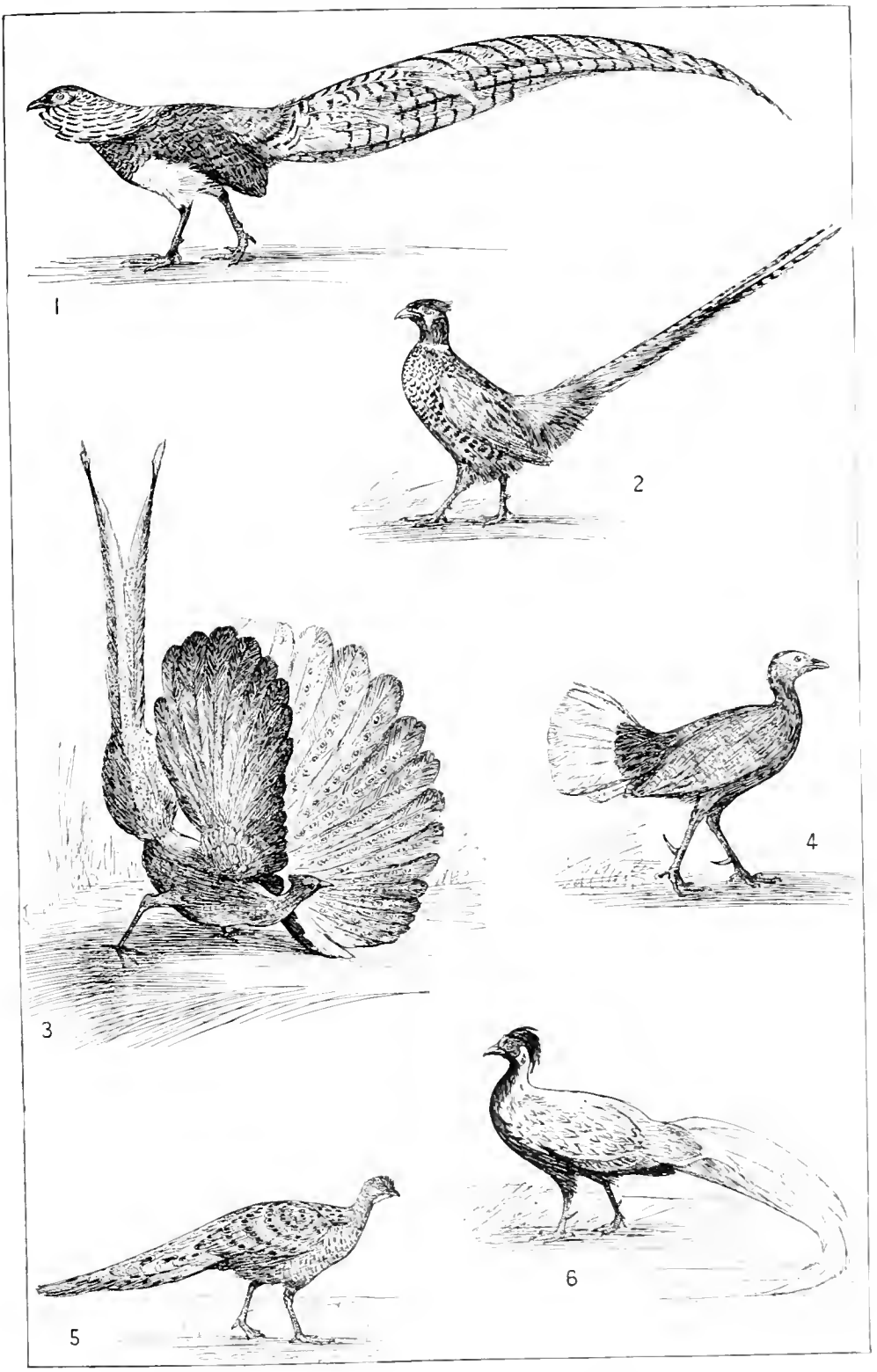
The ordinary weight of a pheasant is about two pounds and a half; but when abundantly supplied with food, and kept undisturbed, they are sometimes $4\frac{1}{2}$ pounds in weight. Pheasants, unlike grouse, are polygamous.

The nest of the pheasant is on the ground, and is a rude heap of leaves and grasses, in which eleven or twelve olive brown eggs are laid. But in the half-domesticated state in which the bird exists in English preserves, the eggs are taken by the gamekeeper, and hatched by hens. Very young pheasants must be carefully supplied with ants, eggs, maggots, etc., and the whole difficulty of rearing them is in their earliest stage. Adult pheasants feed indiscriminately on berries, seeds, roots, young shoots of plants, worms, insects, etc. They roost in trees. The male pheasant takes flight much more readily than the female, which often remains still until the sportsman is almost upon her. The males and females do not associate together except during the breeding season, but small numbers of one sex are often found in company. The 'short crow' of the males begins to be heard in March. In England and Scotland pheasant-shooting legally begins on October 1st and ends on February 3d. The pheasants turned out from the gamekeeper's breeding-yard into a preserve are in general supplied with abundance of food during winter, and come to the accustomed call as readily as any kind of poultry, so that the sportsmanship of a *battue*, in which they are killed by scores or hundreds, is of the lowest kind. The pheasant exhibits a remarkable readiness to hybridize with other gallinaceous birds; a hybrid between it and the common fowl is not infrequent, and is called a *pero*. Hybrids with the black grouse have also occurred. The flesh is excellent for eating.

The common pheasant is typical of the whole group. The genus Phasianus contains some fifteen other species, all natives of Central or Eastern Asia. Of these, Reeve's pheasant of Northern China is a large bird with notably white and edible flesh. The general color is golden yellow, each feather barred with black; the flanks are white with a chestnut margin, and the belly is black. The tail is extremely long, the central feathers sometimes measuring five or six feet; they are white margined with buff and barred with black and chestnut. Wallich's pheasant, the 'cheer' of the sportsmen of Northeastern India, is another large species, found only at elevations above 4000 feet, and remarkable because both sexes crow. It has a long dark-brown crest, and the general color is yellowish-brown, rufous and ashy, more or less barred with black. The Mongolian pheasant (*Phasianus Mongolicus*), the green-breasted pheasant (*Phasianus versicolor*), and Soemmering's pheasant (*Phasianus Soemmeringii*) are of special interest because they have been introduced into various parts of the United States. In Oregon they are so abundant in many places as to be a nuisance.

Four other genera are included in the Phasianinæ. Of the genus Ithogines, known as 'blood' pheasants, three species are alpine birds of the Himalayas and China. They are remarkable for their hardiness, living close to the limits of perpetual snow, and for the large number (three to five) of spurs on the tarsus of the male. The genus Euplocomus (or Gennæus) contains 14 species, known as 'fire-back' (or Macartney), 'kaleege,' and 'silver' pheasants. They are birds of very rich plumage, the lower back being fiery, metallic red; the bare skin of the head is deep blue or red. They are natives of Southeastern Asia and range from Formosa to Sumatra. Some of the fire-backs have short, square tails in both sexes, while others have the broad, elongated tails. The Chinese silver pheasant (*Gennæus nycthemerus*) is a good ex-

PHEASANTS



1. LADY AMHERST'S GOLDEN PHEASANT (Chrysolophus Amherstiæ).
2. COMMON PHEASANT (Phasianus Colchicus).
3. ARGUS PHEASANT (Argusianus giganteus).
4. BORNEAN PHEASANT (Lobiophasis Bulweri).
5. PEACOCK PHEASANT (Polyplectron bicalcaratum).
6. CHINESE SILVER PHEASANT (Gennæus nycthemerus).

ample of that group: the upper parts and tail are white, more or less finely mottled with black, while the under parts are bluish-black. They are forest-loving birds and not gregarious. The kaleege pheasants are generally dark-colored, with long pendent crests; the tail is usually bluish-black. The third genus contains only one species, the remarkable Bulwer's pheasant (*Lobiophasis Bulweri*) from Borneo. There are three pairs of peculiar outgrowths of nude skin on the head; the plumage is metallic of various hues; and the tail, which is made up of thirty rather stiff feathers, bare near the tip, is pure white. In the female the tail contains only twenty-eight feathers. Allied to these is the Impeyan pheasant (*Lophophorus Impeyanus*).

A very striking form, often seen in menageries and private parks, is the Indo-Malay Argus pheasant (*Argusianus giganteus*), which has not only a long and splendidly ocellated tail, but the secondaries of the wings are enormously developed; the way in which these ornamental feathers are displayed in the courting season appears in the illustration of this species on the Plate of PHEASANTS.

The species of Chrysolophus includes some very gorgeous birds. The type (*Chrysolophus pictus*) has the back metallic green, the under parts scarlet, the rump golden-yellow, the crest amber-colored, and a ruff about the neck orange-red tipped with blue, while the Lady Amherst pheasant (*Chrysolophus Amherstiæ*) has the breast metallic green and the belly white, the crest crimson with white tips, and the ruff white margined with deep green. Lady Amherst's pheasant also has an excessively long tail. Little is known about these pheasants except that they are very hardy birds, living in thick woods on the mountains at moderate heights. They are extremely jealous birds, and though both occur in China, they are not found in the same valleys nor on the same mountains, but keep entirely separate.

The peacock-pheasants comprise a large number of species found from India to China and on the Malayan islands, and are gorgeously colored, with many peacock-like 'eyes' on the tail-feathers of the males.

Several more or less related birds are called 'pheasants' by colonists and sportsmen in various parts of the world, e.g. our ruffed grouse in the Southern United States.

Consult: Evans, *Birds* (London, 1903); Stejneger, *Standard Natural History*, vol. iv. (Boston, 1885); Elliot, *Monograph of the Phasianidæ* (colored plates, London, 1870-72); Tegetmeier, *Pheasants: Their Natural History and Practical Management* (ib., 2d ed., 1881).

PHEASANT'S-EYE. See ADONIS, and Plate of ACANTHUS.

PHEASANT-SHELL. A gastropod mollusk of the family Turbinidæ, of which the shells are much valued for their beauty, suggesting, by their gorgeous metallic tints, the plumage of pheasants; when, formerly, they were rare in collections, they were sometimes sold for extraordinary prices. They are now comparatively cheap and plentiful, being found in great numbers in Australia.

PHÈDRE, fā'dr'. A tragedy in five acts by Racine, first presented at the Hôtel de Bourgogne in 1677. The subject is taken from the *Hippolytus* of Euripides. Phèdre is represented as experiencing all the phases of profound passion, with an underlying moral sense which produces poignant remorse and repentance. The character is one of the strongest in the French drama. The play was translated into German iambics by Schiller in 1805.

PHE'GEUS (Lat., from Gk. *Φηγεύς*). An Arcadian king who gave his daughter in marriage to Alcmæon. The latter gave his wife the peplus and necklace of Harmonia, but was slain by the sons of Phegeus when he attempted to recover his gifts in order to give them to his later wife, Calirrhoë. Phegeus in turn was killed by the sons of Alcmæon.

PHEI'DIAS. See PHIDIAS.

PHELLODERM (from Gk. *φελλός, phellos*, cork + *δέρμα, derma*, skin). The plant tissue produced internally by the phellogen (q.v.). See HISTOLOGY.

PHELLOGEN (from Gk. *φελλός, phellos*, cork + *-γενής, -genēs*, producing, from *γίγνεσθαι, gignesthai*, to become), or CORK CAMBIUM. A zone of actively dividing cells which give rise externally to the cork tissue (periderm), and internally to secondary cortex (phellodern) of the bark. See HISTOLOGY.

PHELPS, ANSON GREENE (1781-1853). An American merchant and philanthropist, born in Connecticut. He removed to Hartford at the age of eighteen, and established himself in the saddlery business. In 1815 he removed to New York, and engaged as a merchant in tin plate and heavy metals. He accumulated a large fortune, partly by investments in real estate, and devoted a large part of his property to benevolent purposes. He was president of the blind asylum, of the American Board of Commissioners for Foreign Missions, and of the New York branch of the Colonization Society. He bequeathed to religious and charitable institutions $371,000, and intrusted to his son a fund of $100,000, to dispose of in charity. Ansonia, Conn., was named in his honor.

PHELPS, AUSTIN (1820-90). An American clergyman and author. He was born at West Brookfield, Mass., entered Hobart College at the age of thirteen, studied at Amherst and the University of Pennsylvania, and took his degree from the latter in 1837. After further study at the university, at Union Theological Seminary, and at the Yale Divinity School, in 1842 he became pastor of the Pine Street Congregational Church in Boston, where he remained until 1848, when he accepted the chair of sacred rhetoric at Andover Theological Seminary. He remained here for thirty years, assuming in 1869 the presidency in connection with the work of his professorship. In 1879 he resigned both positions because of ill health, and thereafter lived in retirement, though freely contributing, mainly through the columns of *The Congregationalist*, to current theological discussions. He published several devotional works, and a number of volumes which were the outgrowth of his professional duties, among which may be mentioned *Studies of the Old Testament* (1879); *The Theory and Practice of Preaching* (1881); *English Style in Public Discourse* (1883); *Men and Books, or Studies on Homiletics* (1882); *My Study and Other Essays* (1885); *My Note-Book: Fragmentary Studies in Theology and*

[illegible] 1889). Consult his [illegible] Elizabeth Stuart Phelps Ward (New York, 1891).

PHELPS, Edward John (1822-1900). An American political leader and diplomat, born at Middlebury, Vt. He graduated at Middlebury College in 1840, and three years later was admitted to the bar in his native town. In 1845 he removed to Burlington, where he remained until 1851, when he was appointed Second Comptroller of the United States Treasury. He was then a pro-slavery Democrat, and was afterwards a strong opponent of the Civil War. In 1870 he was a member of the Vermont Constitutional Convention. Ten years later he was elected president of the American Bar Association, and in 1881 was appointed Kent professor of law at Yale. This position he held until his death. For a while he was absent from his chair when President Cleveland appointed him Minister to the Court of Saint James's. In 1893 he was appointed senior counsel for the United States in the Bering Sea arbitration. Among his publications are *The Life and Character of Charles Linsley*, and a posthumous collection of his *Orations and Essays* (1901), edited by J. G. McCullough, to which is prefixed a *Memoir* by J. W. Stewart.

PHELPS, Elizabeth Stuart (1815-52). An American author, the daughter of Prof. Moses Stuart of Andover Theological Seminary, and wife of Prof. Austin Phelps of the same institution. She was born in Andover, Mass. Her tales of New England and chiefly of clerical life showed considerable promise. Her *Sunnyside* (1851, republished in Edinburgh as *Manse of Sunnyside*) was remarkably popular.

PHELPS, Elizabeth Stuart (1844—). An American author. See Ward, Elizabeth Stuart Phelps.

PHELPS, John Wolcott (1813-85). An American soldier, born at Guilford Centre, Vt. He graduated at West Point in 1836, and soon thereafter participated in campaigns against the Creeks and Seminoles. During the Mexican War he was engaged in several of the most important battles, and in 1850 was commissioned captain of the Fourth Artillery. In 1859 he resigned from the army, but on the outbreak of the Civil War entered the Federal service as colonel of the First Vermont Volunteers. On May 17, 1861, he was commissioned brigadier-general of volunteers, and was sent to occupy Newport News. He took military possession of Ship Island, Miss., in November, 1861, and coöperated with Farragut in opening up the Lower Mississippi in April, 1862. After the occupation of New Orleans he, on his own initiative, organized the first negro troops enrolled for service in the Federal armies. This action caused great excitement among the Confederates, whose Government on August 21, 1862, declared him an outlaw for having organized and armed negro slaves. The authorities at Washington were not then ready to support Phelps, and ordered the troops to be disbanded and to be employed as laborers. On receiving this order General Phelps resigned, August 21, 1862, and took no further part in the war. During the latter years of his life he devoted himself to an anti-Masonic agitation, and in 1880 was nominated for the Presidency by the 'American' Party. He wrote several books, including a *History of Madagascar* (1884), and the *Fables of Florian* (1888); and translated de la Hodde's *Sociétés secrètes de France* (1864). Consult Howard, *Life and Public Services of Gen. John Wolcott Phelps* (Brattleboro, Vt., 1887).

PHELPS, Oliver (1749-1809). An American merchant and land speculator, born in Windsor, Conn. In 1788 he, with Nathaniel Gorham, contracted to buy from Massachusetts 6,000,000 acres of land in the Genesee country of New York for £300,000 to be paid in 'consolidated stock,' a scrip issued by Massachusetts and then much depreciated. This tract was included within the charter limits of both States, and by a compromise in 1786 ownership was given to Massachusetts, while New York retained the sovereignty. The Indian title to 2,600,000 acres was extinguished and a land office was opened at Canandaigua, N. Y. The rapid rise in price of the scrip made full payment impossible, and the remainder of the original tract was surrendered to the State. In 1790 Phelps sold to Robert Morris the unsold portion of the purchase, about 2,100,000 acres. In 1795, with Gideon Granger and others, he purchased from Connecticut 3,300,000 acres in Ohio, the so-called 'Western Reserve,' but soon sold his interests and returned to Canandaigua. From 1803 to 1805 he was a member of Congress, and was later a circuit judge. He took an active interest in the construction of the Erie Canal and built steamers on Cayuga Lake.

PHELPS, Samuel (1804-78). An English actor and manager, born and educated at Devonport. He made his first appearance in an amateur performance at the Olympic in 1825. After playing in the provinces he made his début in London as Shylock at the Haymarket (1837), and he appeared the same season with Macready at Covent Garden. He rivaled that actor and Charles Kean in certain Shakespearean rôles, such as Lear, Othello, Macbeth, and Antony, and was equally strong in the comic characters Falstaff, Bottom, and Christopher Sly; but his most notable achievement was his joint managership of the Sadler's Wells Theatre, Islington (1844-62), where he produced more than thirty of Shakespeare's plays, and those of other legitimate dramatists, with incalculable educational results both upon public taste and upon the actors employed. The undertaking was less successful financially after the retirement of Greenwood, the business partner (1860), and Phelps had abandoned it for a Drury Lane engagement by 1863.

PHELPS, Thomas Stowell (1822-1901). An American naval officer, born in Buckfield, Maine. He graduated at the United States Naval Academy in 1846, and saw service in the wars with Mexico and with the Indians of the Northwest coast (1855-56). He was on the Paraguay expedition (1858-59), served on the United States Coast Survey, made surveys of Southern harbors at the beginning of the Civil War (1861), and took part in several later naval engagements, especially in command of the *Juniata* before Fort Fisher (1865). He was promoted to be captain in 1871, commodore in 1879, rear-admiral in 1882, commander-in-chief of the South Atlantic squadron in 1883-84, and retired in 1885. Besides sailing directions for the Straits of Magellan, he wrote *Reminiscences of Seattle, Wash-*

ington Territory, and the United States Sloop-of-War Decatur During the Indian War of 1855-56 (1902).

PHENACETINE (from *phenol* + *acetine*). PARA-ACETPHENETIDINE. A coal-tar derivative strongly resembling acetanilid. It occurs as a tasteless and odorless, white, glossy, crystalline powder. It is slightly soluble in water and freely in alcohol. Its physiological action and uses are similar to those of antipyrin (q.v.). The after-effects of phenacetine are, however, less marked than those following antipyrin, and it is considered safer. It is chiefly employed for the relief of pain.

PHEN'ACO'DUS (Neo-Lat., from Gk. φέναξ, *phenax*, cheat + Lat. *coda, cauda*, tail). One of the earliest fossil ungulates, or hoofed mammals, skeletons of which are found in the Lower Eocene beds of Wyoming. It is one of the most primitive ungulates, belonging to the suborder Condylarthra, in which group the carpal and tarsal bones of the feet are wholly serial, and it presents some characters indicative of its creodont ancestry. It was a small animal of slender build, between five and six feet long, with small head, pig-like teeth, low fore-quarters, hind limbs that were much more powerful than the fore limbs, and with a long, slender tail. The feet were five-toed and somewhat digitigrade, and the larger size of the second, third, and fourth toes suggests that these were of more use in running than were the other two. A finely mounted skeleton of this animal is in the American Museum of Natural History in New York City.

PHENICIA, fē-nīsh'ā. See PHŒNICIA.

PHENICIN (Fr. *phénicine*, from Gk. φοῖνιξ, *phoinix*, purple-red), or PHENYL BROWN. A rich dye, first prepared by Roth in 1863 by the action of nitric and sulphuric acids on carbolic acid or phenol. It is a brown, amorphous powder, very soluble in alcohol, ether, and acetic acid, but only slightly soluble in water. It consists of two coloring matters, one yellow, the other a black, humus-like body. The exact chemical composition of the dye is unknown. It was formerly much used in coloring leather.

PHENOCRYST (from Gk. φαίνειν, *phainein*, to show, appear + κρύστ-αλλος *krust-allos*, crystal). The name used in petrology to designate crystal individuals in a rock that possesses more perfect boundaries and are of larger size than the remaining constituents. A rock containing such crystals is said to have a porphyritic texture. They indicate that a rock has passed through two stages of crystallization, the first leading to the formation of the phenocryst and the second to the formation of the ground mass. The first stage generally takes place while the rock mass exists in a molten condition within the earth; while the ground mass is the result of rapid cooling after the rock has been erupted.

PHENOLOGY (abbreviation of *phenomenology*, from Gk. φαινόμενον, *phainomenon*, phenomenon, nom. sg. neu. of pres. part. mid. of φαίνειν, *phainein*, to appear — -λογία, *-logia*, account, from λέγειν, *legein*, to say). That branch of ecology in which attempts are made to determine the influence of climatic factors on plant life by means of meteorological observations. See DISTRIBUTION OF PLANTS.

PHENOLS (Fr. *phénol*, from Gk. φαίνειν, *phainein*, to appear). An interesting class of carbon compounds, the simplest of which is ordinary carbolic acid (q.v.). The phenols are derivatives of benzene, and they are characterized chemically by one or more hydroxyl groups attached immediately to the so-called benzene nucleus (a ring made up of six atoms of carbon). The phenols are distinguished from the alcohols (q.v.) by having the properties of acids. Thus, unlike the alcohols, they combine with metallic hydroxides to form phenates (the alcohols form alcoholates with the alkali metals themselves, but not with their hydroxides). On the other hand, they are distinguished from acids by containing no carboxyl group (COOH) and by being weaker than the weakest carboxylic acid known, viz. carbonic acid. Their weakness as acids may be readily demonstrated by passing a current of carbonic acid gas into a solution containing, say, some phenate of sodium; the carbonic acid will then take the sodium away from the phenol, sodium carbonate will be formed, and the phenol will be set free. Among the characteristic reactions of the phenols must also be mentioned the fact that they all give colorations with ferric chloride. The principle on which fatty alcohols, phenols, and aromatic alcohols are classified and distinguished from one another symbolically, may be seen from the following formulas, showing simple representatives of the three classes in question:

CH_3OH	C_6H_5OH	$C_6H_5CH_2OH$
Methyl alcohol (fatty)	Carbolic acid (a phenol)	Benzyl alcohol (aromatic)

The distinction between the fatty alcohol and the other two substances is in the hydrocarbon radicals which hold the hydroxyl groups; the distinction between the phenol and the aromatic alcohol is in the fact that in the former the hydroxyl group is attached directly to one of the atoms of the group C_6, while in the latter the hydroxyl is linked to the C_6 ring by the group CH_2. See ACIDS.

PHENOMENON. A philosophical term meaning appearance (q.v.).

PHENYL (from *phenol*), C_6H_5. A chemical radical, i.e. a group of atoms possessed in common by the molecules of different compounds, but incapable of independent existence. See CARBON COMPOUNDS.

PHE'RÆ (Lat., from Gk. Φεραί). An ancient city of Southeastern Thessaly, about ten miles west of its harbor, Pagasæ, at the head of the Pagasæan Gulf; in Greek legend, the ancient royal seat of Admetus and Alcestis. In the early part of the fourth century B.C. the power was in the hands of Jason, son of Lycophron, who had become tyrant about the close of the Peloponnesian War. Jason was a man of marked ability, and by B.C. 374 had forced his recognition as chief of the Thessalians, and began to play an important part in the affairs of Greece, while it was said that he meditated the invasion of Persia. He was assassinated in B.C. 370. His nephew, Alexander, succeeded to his rule, but was soon confined by the Thebans to the tyranny over Pheræ. After displaying the utmost cruelty for eleven years, he was finally murdered by his wife's brothers, B.C. 357. Five years later Pheræ, with the rest of Thessaly, became subject to Philip of Macedon. At Pheræ

the [illegible] a fountain, spring, and Hyperia, famous for its reading virtues, which still flows in the centre of the modern village of Velestino.

PHERECRATES. fĕ-rĕk'ra-tēz (Lat., from Gk. *Φερεκράτης, Pherekratēs*). One of the most eminent writers of the Old Attic Comedy; a contemporary of Cratinus, Crates, Eupolis, Plato, and Aristophanes. He invented the *Pherecratean* metre (⏑ – ⏑ – ⏑ –), which is frequently used in the choruses of the Greek tragedies and in Horace. A few fragments and the titles of eighteen of his plays are extant. Consult: Meineke, *Fragmenta Comicorum Græcorum* (Berlin, 1839); and Kock, *Comicorum Atticorum Fragmenta* (Leipzig, 1880). Among the ancients he was famed for his wealth of invention and the purity of his Attic Greek.

PHERECYDES. fĕ-rĕs'i-dēz (Lat., from Gk. *Φερεκύδης, Pherekydēs*). (1) One of the earliest writers of Greek prose. He was born in the island of Syros, and flourished in the sixth century B.C. He composed a cosmogonic work on nature and the gods, entitled Πενταέμυχος (*Pentaemychos*), because, according to its doctrine, five elements made up the universe, ether, fire, air, water, and earth. That he taught Pythagoras his doctrine on the transmigration of souls may well be doubted. A fragment on the sacred marriage of Zeus and Chthonia has recently been discovered in Egypt: published by Grenfell, p. 22, *New Classical Fragments* (Oxford, 1897). The fragments formerly known, together with those of the following author, are published by Müller, *Fragmenta Historicorum Græcorum* (Paris, 1850).

(2) A logographer and native of Leros, who flourished in the middle of the fifth century B.C. He spent the greater part of his life at Athens, where he wrote his Genealogies or Autochthones (Γενεαλογίαι or Αὐτόχθονες), a work of ten books in the Ionic dialect on the descent of the gods and the noble Greek families. The extant fragments are published as indicated under (1) above. Consult, also, Luetke, *Pherecydea* (Göttingen, 1893).

PHERETIMA. Wife of Battus III. and mother of Arcesilaüs III., kings of Cyrene. To avenge the murder of her son by the Barcæans, she induced the Persian viceroy in Egypt to attack their city. After the city fell she caused those chiefly responsible for her son's death to be impaled and the breasts of their wives to be cut off.

PHERSA'LA. The modern name of the Greek city Pharsalus (q.v.).

PHI BE'TA KAP'PA FRATERNITY. A society which derives its name from the initials of the three Greek words φιλοσοφία βίου κυβερνήτης, (Philosophy the Guide of Life). It was formed at the beginning of the Revolutionary War (December 5, 1776), in William and Mary College, at Williamsburg, Va. It is the oldest of the so-called Greek letter societies. Its original purposes were the encouragement of patriotism and scholarship, and especially of literature. Within five years chapters were established in Harvard and Yale, and still later before the close of the century) in Dartmouth. In recent years, the number of chapters has been greatly enlarged. With varying periods of energy and inertia, the society has existed until this day, when it is more extended and [illegible] than ever. Its anniversaries, usually observed at commencement, but not always, have been marked by the delivery of orations and poems, and frequently by banquets with post-prandial speeches. Many of the foremost speakers of the country have appeared on these occasions. Membership in the fraternity is conferred upon those undergraduates who are among the best scholars, and honorary members, later in life, are occasionally chosen from among the scholars of the country not previously elected. The secrecy of the original society was abandoned at the time of the anti-Masonic agitation. The members are entitled to wear as a badge a gold watchkey with simple emblems and inscriptions. See Plate COLLEGE FRATERNITIES, under FRATERNITIES). The following is a list of the different chapters and the dates of their establishment: William and Mary (1776), Yale (1780?), Harvard (1780?), Dartmouth (1787), Union (1817), Bowdoin (1824), Brown (1830), Trinity (1845), Wesleyan (1845), Western Reserve (1847), Vermont (1848), Amherst (1853), Kenyon (1858), New York University (1858), Marietta (1860), Williams (1864), New York City College (1867), Columbia (1868), Middlebury (1868), Hamilton (1869), Rutgers (1869), Hobart (1871), Colgate (1875), Cornell (1882), Dickinson (1886), Lehigh (1886), Rochester (1886), De Pauw (1889), Lafayette (1889), Kansas (1889), Northwestern (1889), Minnesota (1892), Pennsylvania (1892), Tufts (1892), Colby (1895), Iowa (1895), Johns Hopkins (1895), Nebraska (1895), Swarthmore (1895), Syracuse (1895), Boston University (1898), California (1898), Chicago (1898), Cincinnati (1898), Haverford (1898), Princeton (1898), Saint Lawrence (1898), Vassar (1898), Wabash (1898), Wisconsin (1898), Allegheny (1901), Missouri (1901), and Vanderbilt (1901).

In 1881, at the instance of the Harvard chapter, delegates met, and after some preliminary discussion a call was issued for a general body, which convened in Saratoga on September 5, 1883, when delegates from sixteen chapters ratified the constitution, organizing a National Council, consisting of twenty senators, and delegates not exceeding three in number from the several chapters of the society. The influence of this national body is chiefly directed toward the establishment of uniform customs with regard to membership and practices. Under its supervision a general catalogue, containing in some form the names and addresses of 17,000 members of the society, has been prepared.

PHIDA'RI. A river in Ætolia, Greece. It rises in the Vardusia Mountain and, after a southwesterly course of about 65 miles, flows into the Gulf of Patras.

PHID'IAS, or **PHEI'DIAS** (Lat., from Gk. *Φειδίας*,). The greatest sculptor of ancient Greece, born in Attica, probably between 500 and 490 B.C., the son of Charmides. His master seems to have been the Athenian Hegias, famous for his statues of divinities, and some late authorities also connect him with the Argive Hagelaïdas; but both these statements have been questioned, and in general the information as to his life is scanty and often contradictory. Interest in the lives of the great artists arose comparatively late, when accurate information was scarcely attainable. For our knowledge of his works we are dependent on the statements of ancient writers,

as no certain original from his hand has survived. The descriptions, however, warrant the assignment to him of the originals from which several marbles were copied, and to his designs are probably due the Parthenon sculptures, though none of them can with certainty be attributed to his hand. The unanimous testimony of the ancients and the evidence of the monuments mark him as the typical artist of the best culture of Greece. His genius found the soil for its ripest expression in the Athens of Pericles, and his works stand with the tragedies of Sophocles as the most perfect expression of the spirit of the noblest period of Greek civilization. Noble ideals and a thorough mastery of technique enabled him beyond any other ancient artist to present beauty in its purity and completeness. In his works we find incorporated the desire of Greek art to reproduce the ideal beauty which lies behind the realities of nature, and which while holding fast to truthful expression seeks to show forth the typical and permanent elements rather than the individual and transitory. This endeavor to express the sublime ideals formed within the soul was recognized by the ancients as the source from which came the inspiration for the colossal statue of Zeus at Olympia, which the artist was said to have drawn from Homer (*Iliad*, i. 529), and which seemed to incorporate the divine majesty, power, and loving kindness. In all the branches of sculpture we find Phidias celebrated. In bronze were wrought the Athena of the Lemnians, probably represented in a statue at Dresden and a head at Bologna, and the colossal Athena sometimes called the Promachos, which ancient tradition at any rate attributed to him; in marble, an Aphrodite in Athens, and the face, hands, and feet of an Athena at Platæa, whose drapery was of gilded wood, thus forming a cheap substitute for the chryselephantine technique in which he attained his greatest fame. His earliest work in this style was an Athena at Pellene in Achæa, but his most celebrated were the Zeus at Olympia and the Athena of the Parthenon. In this style a core of wood was overlaid with ivory to represent the flesh, and gold, often inlaid with enamel, for drapery. On the Parthenos the gold was detachable and valued at 44 talents. The Zeus at Olympia represented the god seated on his throne, on his head a wreath of olive, in his left hand the sceptre crowned with an eagle, while on his extended right stood a Nike (Victory) holding a fillet. The throne was elaborately decorated with figures in relief and in the round. Our only knowledge of this statue is from descriptions and representations on late coins of Elis, which are, of course, far too small to give any satisfactory idea of its appearance. It may be added that the so-called Zeus Otricoli of the Vatican is certainly not Phidian. The Athena Parthenos was a standing figure. In her left hand the goddess held her lance and at her left side stood the shield. The extended right hand also held a Nike, and was perhaps supported by a pillar. Here, too, the shield, the pedestal, the helmet, and even the soles of the sandals were decorated with scenes from Grecian legend. This statue was erected in B.C. 438, and if Phidias supervised the decorations of the Parthenon he must have worked in Athens from about B.C. 447 to 433, for the building was not completed before this date.

The chronology and events of the closing years of his life are much disputed and the ancient testimony is conflicting. All accounts agree that he was tried at Athens for embezzling the gold appropriated for the statue; but, while one account says he died in prison, another says he was banished, went to Elis, made the Zeus, and was then accused and put to death by the Eleans. This last can scarcely be right, as we know his descendants enjoyed hereditary honors at Olympia. The most probable theory is perhaps that the statue of Zeus was made just after the middle of the fifth century B.C., and that after that the artist remained in Athens. It may be regarded as certain that he shared in the attack on the friends of Pericles, and the account may be true that, while acquitted of the charge of embezzlement, he was condemned for impiety in introducing his portrait on the shield of the Parthenos. Many competent archæologists, however, prefer to date the Zeus later than the Parthenos. In addition to the histories of Greek sculpture cited under GREEK ART, consult: C. O. Müller, *De Phidia Vita et Operibus* (Göttingen, 1827); Petersen, *Die Kunst des Phidias* (Berlin, 1873); Collignon, *Phidias* (Paris, 1886); Waldstein, *Essays on the Art of Phidias* (Cambridge and New York, 1885); Furtwängler, *Masterpieces of Greek Sculpture*, trans. by E. Sellers (London and New York, 1895), of great value for the attribution of extant marbles to Phidian originals, but to be used with caution; *Phidias* in "Masters in Art Series" (Boston, 1902), with good bibliography. For the death of Phidias, see, in addition: Loescheke, "Phidias' Tod," in *Historische Untersuchungen* (Bonn, 1882); Schöll, "Der Prozess des Phidias," in *Sitzungsberichte der Münchener Akademie* (Munich, 1888).

PHI'DON. Son of Aristodamidas and King of Argos, eighth century B.C. He restored several towns to the kingdom, but did not succeed in his ambition to extend his authority throughout the Peloponnesus. He is best remembered for the introduction of copper and silver coinage and of a new scale of weights and measures. This system, which finally was used throughout the larger part of Greece, was known as the Aeginetan, from Aegina, whose inhabitants through their commerce did most to extend its use.

PHIGA'LIA. A town of ancient Arcadia, now in the Olympia district of the province of Messenia, 25 miles northwest of Messene. Near by are the falls of Neda. In B.C. 659 Phigalia was taken by the Spartans, but later became free. Its celebrity in modern times is due to the ruins of a magnificent temple on Mount Cotylium at Bassæ in the commune of Phigalia and about four miles from the town proper. See PHIGALIAN MARBLES.

PHIGALIAN MARBLES. The sculptured frieze taken from the interior of the cella of the temple of Apollo at Phigalia, in Arcadia in 1814, and transferred to the British Museum. It represented the contest between the Centaurs and Lapithæ and the Greeks and Amazons. The temple is situated in the extreme southwest of Arcadia, about four miles from Phigalia, on a terrace on the side of a mountain in a picturesque and wild country, and had been completely forgotten till it was accidentally discovered in 1765 by a French architect, Bocher, and soon after was visited and described by the English traveler Chandler, who was followed by Gell, Dodwell, and

[illegible] 1812 it was carefully examined by English and German artists [illegible], the results of whose investigations [illegible] in Stackelberg, *Der Apollo Tempel zu Bassä in Arkadien* (Rome, 1826), and Cockerell, *The Temples of Jupiter Panhellenius at Ægina and Apollo Epicurius at Bassæ, Near Phigaleia, in Arcadia* (London, 1860). The temple is of a soft yellowish brown limestone and is a Doric hexastyle peripteros with fifteen columns on the sides, about 125 feet long and 46 feet wide. Owing to the nature of the ground, it stands north and south, but there is a small side door in the east wall of the cella, opposite the cult statue. Of the 38 columns, 35 are still standing and support much of the architrave, though the pediments and ceiling have fallen. The fallen members lie about the ruin, which seems to have been largely caused by Christian iconoclasm and greed for the metal clamps by which the stones were held. The partial restoration from the existing remains is planned (1903) by the Greek Archæological Society. The sculptures show great skill and boldness in design, but the execution is by no means so praiseworthy, as the proportions are often bad and the faces dull. As the temple was the work of Ictinus, the architect of the Parthenon, it is very probable that the sculptures were designed by an Athenian artist, but the carving is probably the work of less experienced Arcadian sculptors. The fragmentary sculptures on the metopes of the pronaos and opisthodomos are of rather better workmanship. In addition to the general works cited under GREEK ART, by Collignon, Overbeck, Mitchell, and Murray, consult the article "Phigaleia" in Baumeister, *Denkmäler des klassischen Altertums* (Munich, 1889); and Smith, *Catalogue of the Sculptures in the British Museum* (London, 1892).

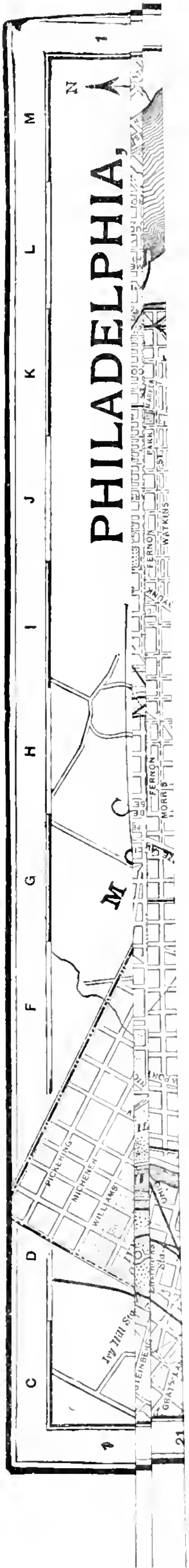
PHI'LA. Daughter of Antipater, regent of Macedonia. She was celebrated as one of the noblest women of her time. In B.C. 322 she was married to Craterus. He died in about a year, and Phila was then married to the son of Antigonus, Demetrius, whose varying fortunes she shared. When Demetrius was banished from Macedonia in B.C. 287, Phila killed herself at Cassandrea. She left two children by Demetrius, Antigonus and Stratonice. The son, surnamed Gonatas, became King of Macedonia; Stratonice became the wife of Seleucus and subsequently of his son Antiochus.

PHILADEL'PHIA (Lat., from Gk. Φιλαδελφεία, *Philadelpheia*, named in honor of Attalus Philadelphus). A city of Asia Minor, now called Alasheir (the 'reddish city,' from the color of the hillsides in the region), situated in the valley which runs inward from the Gulf of Smyrna, about 75 miles east by south of Smyrna (Map: Turkey in Asia, C 3). The city was founded in the second century B.C. It lay on the trade routes from the interior to the coast and assumed a position of commercial importance. Its name was changed at different times, as shown by the coins of Roman emperors, and it was a point of considerable importance in the political affairs of the Province of Asia. Philadelphia was the head of a district in which Christian churches were established very early, since messages were sent to it in the Book of Revelation (iii, 7-13). Little is known concerning [illegible] or size of these churches. Philadelphia [illegible] part in later history, figuring as a bulwark against the Turks. See ALASHEIR.

PHILADELPHIA. The chief city of Pennsylvania, and the third city in population and importance of the United States, co-extensive with Philadelphia County, having an area of 129.5 square miles. It is situated in the southeastern corner of the State, at the confluence of the Schuylkill with the Delaware, about 50 miles from the mouth of the Delaware and 100 miles from the Atlantic Ocean, in latitude 39° 57′ N. and longitude 75° 9′ W. It is distant from New York by rail 90 miles, from Washington 132, and from Chicago 822.

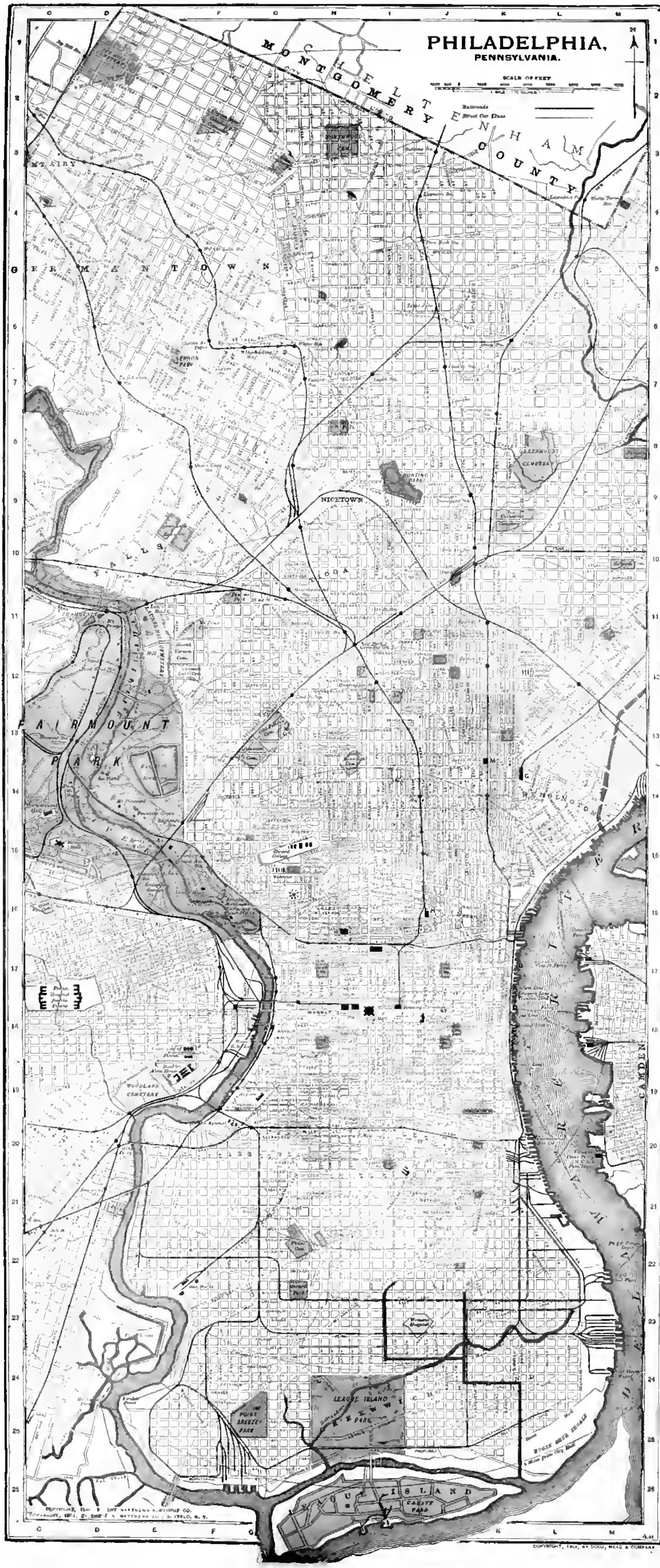
The climate of Philadelphia is considerably milder in winter and warmer in summer than that of the central and western cities of the State. The mean temperature for January is 32.3°, and for July 76.2°. The heat during July and August is often very intense, the temperature rising sometimes above 100°. The average annual rainfall in the city is about 44 inches, slightly heavier than that of New York.

DESCRIPTION. William Penn founded the city on the narrow neck of land, some two miles wide, lying between the Delaware and Schuylkill rivers. Disregarding his plan for a simultaneous growth of the city backward from each river, the early settlers preferred to remain near the Delaware, along which occurred the first north and south expansion of the city. It was not until the beginning of the nineteenth century that the westward growth of the city reached Broad Street, the half-way line to the Schuylkill. From this time on the city has grown more rapidly, extending southward to the junction of the two rivers, westward far beyond the Schuylkill to Cobb's Creek, and northward in two main branches, the easternmost following the Delaware to Poquessing Creek, eighteen miles from the southern limit, and the westerly through the suburban region stretching ten miles along the Wissahickon—a tributary of the Schuylkill. In the western and northern sections of the city large areas of open country still exist. From the dike-protected lowlands of the south, five feet below the average high tide, the city rises gradually to heights of 443 feet in the hilly regions of the northwest. The general plan of the streets is determined by the east and west direction of Market Street, the main business thoroughfare, 100 feet wide, which runs directly west from the Delaware, a distance of six miles, separating the city in respect of street numbering into north and south divisions; and by Broad Street, 113 feet wide and 12 miles long, which at City Hall Square intersects Market at right angles. The main portion of the city is laid out with great regularity, the numbered streets running parallel with Broad, and the named streets with Market. The regularity of the general plan is broken, however, in the portion east of the Schuylkill, by Ridge and Germantown avenues, which intersect diagonally the streets north of Market, and by Passyunk and Moyamensing avenues, south of Market Street; in West Philadelphia, Lancaster Avenue, north, and Woodland Avenue, south of Market Street, act in a similar manner, though in this and in other outlying sections there is, in general, less attempt to follow strictly the regularity of the older portions of the city. There are more than 1560 miles of streets, of which



t. with many
demic air im-
University of
or their villas
burbs of Ger-
n the general
sites Philadel-
he world.
gests its dis-
ly Love;" its
ropriate that
re truly char-
y of Homes"
903), 298,144
ge of 4.5 per-
r cent. owned
church build-
ate, and 247
nevolent pur-
are many sur-
brick houses,
mmings, that
ppearance for
ewer portions
ding material,
built in long
similarly ar-
its neighbors
size with the
larger streets
ad of blocks,
houses is the
lcome variety
rly, and vari-
many streets,
y of the cus-
suburbs the
one or wood.
homes and
reater degree
ity the finer
l to combine
rn industrial

rly architec-
ne of the last
ll buildings,
ll structures
the 'Public
ate their City
n in the early
mmodates all
nd the State
le edifice, of
00 feet high,
t, in central
tower sur-
37 feet high
height of 547
osing a large
nches by 470
a floor space
r great clock
en feet long
ulated by a
ock 143 feet
ldings up to
0, of which
n proper.
dings located
States Mint,
largest and
ld; the Post



some 900 miles are paved with brick, stone, or asphalt, 225 macadamized, and the remainder unpaved. The mileage of sewers is 951 and of water mains 1319. The street railways (employing the overhead trolley system, and in 1902 carrying 325,801,963 passengers) have a total mileage of 475, and the steam railroads of 360. At the present time (1903) there is under construction a subway system of four tracks from the Delaware to the Schuylkill, with an elevated extension along Market Street from the Schuylkill to the city line. Twelve public and twelve railroad bridges cross the Schuylkill, and one railroad bridge the Delaware; and among these are some of the finest structures of the kind in the country.

It is possible to characterize with tolerable accuracy the various sections of Philadelphia. The business life centres around Market Street. The portion north and south of this thoroughfare bordering the Delaware is devoted to wholesale trade, shipping, and warehouses; from Third Street to Eighth, Market, Chestnut, and Walnut may be designated as the financial and banking centre of the city; these streets, with Arch, from Eighth to City Hall, form the great retail shopping section, where are found the great department stores. The large office buildings cluster about the City Hall, at the junction of Broad and Market Streets, in the vicinity of which are also found the Pennsylvania and Reading depots and the Baldwin Locomotive Works. Westward from the City Hall, Market Street is lined by smaller wholesale and retail establishments; while beyond the Schuylkill, Lancaster and Woodland avenues dispute its supremacy in retail trade. The northeastern section, comprising Kensington and Frankfort, and certain portions of the northwest section form the chief textile centre of the city; the northeast section at Port Richmond is also the location of Cramp's ship-yards. The southern portion, east of the Schuylkill, is devoted to general manufactures and to transportation.

The residential portions of the city seem to be as clearly divided by Market Street as are the business interests. South of that thoroughfare, on Chestnut, Walnut, and Spruce streets, centring about Rittenhouse Square, is the aristocratic residential section of the city. North of Market the upper portion of Broad Street, with portions of other streets between it and the Schuylkill, forms another important residence area. North of this comes the residential section occupied largely by textile operatives. South of Market and extending a few blocks below Lombard is the section occupied by the foreign and colored elements, with the former, consisting largely of Italians and Hebrews, grouped to the east of Broad, and the negroes between Broad and the Schuylkill. In this region are located most of the slums of the city, though the peculiarities of the building plan permit them to exist in the rear of the best residential sections. West of the Schuylkill, Market Street continues to divide West Philadelphia into two distinct residential portions; for the northern the character is largely determined by the proximity of the main freight yards of the Pennsylvania Railroad, whose employees, together with employees from the downtown business district, constitute the bulk of its population. The southern is a more pretentious residence district, with many notable residences and with an academic air imparted to it by the presence of the University of Pennsylvania. Especially noted for their villas and gardens are the attractive suburbs of Germantown and Chestnut Hill; and in the general beauty of its numerous suburban sites Philadelphia is unsurpassed by any city of the world.

By its name Philadelphia suggests its distinctive title "The City of Brotherly Love;" its early history renders especially appropriate that of "the Quaker City;" but none more truly characterizes it than that of "The City of Homes." Of 323,783 buildings of all kinds (1903), 298,144 are dwelling houses, with an average of 4.5 persons per dwelling, and with 22 per cent. owned by the occupants. There are 800 church buildings, 474 schools, public and private, and 247 buildings used for charitable and benevolent purposes. In the older portions there are many survivals of the long blocks of red brick houses, with white marble steps and trimmings, that early gave Philadelphia the neat appearance for which it is still famous. In the newer portions red brick is still the principal building material, and the residences are commonly built in long blocks of houses of four or more similarly arranged rooms, each separated from its neighbors by a brick party-wall, and varying in size with the width of the street. On some of the larger streets the houses are built in pairs, instead of blocks, but the arrangement of the separate houses is the same. There is, however, a more welcome variety in styles of architecture than formerly, and various kinds of building stone, along many streets, are beginning to break the monotony of the customary brick, while in the better suburbs the residences are almost wholly of stone or wood. In general, Philadelphia, in its homes and parks, may be said to retain to a greater degree than any other large American city the finer qualities of its early town life and to combine with these the best features of modern industrial development.

Buildings. Adherence to an early architectural idea has made Philadelphia one of the last of large American cities to favor tall buildings. Very recently, however, a group of tall structures has sprung up in the vicinity of the 'Public Buildings,' as Philadelphians designate their City Hall. This immense structure, begun in the early 70's, and covering 4½ acres, accommodates all the municipal and county officers, and the State and county courts. It is a marble edifice, of modern French Renaissance style, 90 feet high, rising in corner pavilions to 161 feet, in central pavilions to 203 feet, and in the tower surmounted by a colossal statue of Penn (37 feet high and weighing 53,348 pounds) to a height of 547 feet 11½ inches. The building, inclosing a large central court, measures 486 feet 6 inches by 470 feet, and in it are 634 rooms, with a floor space of 14½ acres. In the tower are four great clock dials, each with a minute hand eleven feet long and weighing 225 pounds, and regulated by a vibration and temperature proof clock 143 feet below. The cost of the Public Buildings up to December 31, 1902, was $24,344,350, of which some $18,250,000 was for construction proper.

Among the important Federal buildings located within the city are the new United States Mint, on Spring Garden Street, one of the largest and most completely equipped in the world; the Post

Office Building, bounded by Market, Chestnut, Tenth and Ninth, occupying the site of the first President's Mansion and the subsequent home of the University of Pennsylvania; the Custom House, on Chestnut Street near the Delaware, modeled after the Parthenon, and erected in 1819-24 for the Second United States Bank; the Arsenal, below South Street near the Schuylkill; and at the southern end of Broad Street, the large League Island Navy Yard. Of the historic buildings the most important are the familiar Independence Hall and Carpenter's Hall on Chestnut Street, inseparably associated with the early Continental and Federal Congresses; the Betsy Ross House on Arch Street, where the first American flag was made; the Old Swedes (1700) and Old Christ (1727) churches of Revolutionary fame; and the first United States Mint, on Seventh Street below Market. The Pennsylvania Historical Society, one of the strongest organizations of its kind in the country, has an elegant building at Thirteenth and Locust streets.

Now that Philadelphia has adopted the modern steel frame building (with a careful regulation of height, however), its recent business structures will compare favorably in size and importance with those of any other American city. Among the leading office buildings may be mentioned the Land Title Annex (319 feet high); the pioneer Betz Building; the Real Estate Trust Building; the Arcade Building, and the Commonwealth Trust Building—all grouped around the City Hall; and the Real Estate Title and Trust Company Building, the Drexel Building, the Bullitt Building, and the Provident Building—notable structures of the financial area. In this vicinity, also, is the Philadelphia Contributionship 'Hand in Hand,' the oldest fire insurance company in America, of whose directorship Franklin was an early member. The Pennsylvania Railroad station, with a train shed over 700 feet long, and the Reading Terminal, a handsome railroad station, approached like that of the Pennsylvania Railroad by a viaduct, are notable railway terminals and office headquarters. Of newspaper buildings the most prominent are those of *The North American* (22 stories), *The Record*, and *The Public Ledger*. Of semi-public organizations the Stock Exchange is housed in the remodeled Merchants' Exchange Building; the Bourse Building is the home of the Board of Trade, the Trades League, and other trade organizations; and the Commercial Museum, supported by municipal, State, and Federal appropriations, and devoted to the encouragement of foreign commerce, especially with Spanish America, is located temporarily on Fourth Street, pending the erection of a permanent structure in West Philadelphia, on the site of the Exposition of 1899. Philadelphia has many important hotels, among the most elegant and commodious of which may be mentioned the Walton and the new Bellevue-Stratford, both on Broad Street near City Hall.

With structures representing interests that are not strictly utilitarian Philadelphia is well supplied. The Masonic and Odd Fellows' temples, on North Broad Street, rank with the best society structures on the continent. The Young Men's Christian Association Building on Fifteenth Street, that of the Young Women's Christian Association on Arch street, the Crozier Building of the Baptist Publication Society, the Witherspoon Building, with the publication rooms, general offices, and historical museum of the Presbyterian Church (North), represent in highest perfection the application of modern business methods to religious work. In addition to the historic churches already mentioned, the most important edifices are the Roman Catholic Cathedral, the Kenneth Israel Synagogue, and the Baptist Temple on North Broad Street, Holy Trinity (Protestant Episcopal) on Rittenhouse Square, the Arch Street (Methodist Episcopal), the First Presbyterian and the Tabernacle Presbyterian and the Friends' Meeting House on Arch Street—the Quaker Westminster of America. Of educational institutions the University of Pennsylvania, Drexel Institute, the new Boys' High School, Girard College with its early Grecian structures, and the Roman Catholic High School are architecturally of importance.

Parks. The system embraces about 4000 acres. Public interest has been aroused of late in the development also of parkways. William Penn expressed the desire to make Philadelphia a 'greene country towne;' and his surveyor Holme placed on the plan, near its four angles, rectangular open spaces, now Logan (northwest), Rittenhouse (southwest) Franklin (northeast), and Washington (southeast) squares, containing an aggregate of 28½ acres. These, together with Central Square, the site of the original waterworks, but now of City Hall, formed a cherished precedent. In 1903 there were under the care of the Bureau of City Property more than 50 small parks and plots containing over 600 acres. The largest was League Island Park (300 acres), contiguous to the League Island Navy Yard. In Independence Square the Declaration of Independence was read to the populace. Penn Treaty Square marks the site of the great elm under which, according to tradition, the founder made his famous compact with the Indians. In Logan Square was held in the summer of 1864 the great Sanitary Fair. Bartram's Garden (27 acres), on the banks of the Schuylkill, was the first botanical garden in the New World. Its noteworthy arboreal collection has been preserved.

The city's greatest pleasure ground is Fairmount Park, rich in natural beauties. The Schuylkill divides it into East Park, with over 633 acres, and West Park, with 1323 acres. Along the Wissahickon is the Wissahickon Valley extension of 1010 acres. The acquisition in 1812 of five acres on Morris's Hill, the original Fair Mount, for water-works and park purposes, led to the formation of the park. To this were added areas of woodland, and country seats, the Lansdowne estate of Governor John Penn, Eaglesfield, Sweet Briar, and Solitude; the Belmont home of Judge Peters of the Supreme Court, where Washington, Franklin, Jefferson, Lafayette, and others visited; Mount Pleasant, the residence of Benedict Arnold; George's Hill (83 acres), presented by Jesse and Rebecca George; Strawberry Mansion, Lemon Hill, Ormiston, and Edgely. The miniature Letitia House, built by William Penn for his discontented daughter, was transported from the city. The Zoölogical Gardens are maintained by private subscription, admission receipts, and municipal appropriations contingent upon the free admission of school children. The Centennial Exposition of 1876 brought many noteworthy structures into the park, the most important that remain being Horticultural Hall, with a fine exotic collection, and Memorial Hall,

INDEPENDENCE HALL

PHILADELPHIA

CITY HALL

where are exhibited the Wilstach Art Collection and the display of the Pennsylvania Museum and School of Industrial Art. A trolley line, below grade, eight miles long, extends to the chief points of attraction. A speedway, one mile in length, is being completed. The Schuylkill is frequently the scene of regattas, and there are handsome stone boat houses on its eastern bank.

Many fine monuments have been placed in the park. The Washington Monument by Siemering of Berlin is the most imposing. Funds for its erection were provided by the Society of the Cincinnati, the subscriptions, begun in 1819, aggregating $250,000 when the monument was unveiled in May, 1897. It stands at the Green Street entrance, the termination of the Park Boulevard. This thoroughfare, projected in 1903, is to be 160 feet wide from City Hall to Logan Square, and thence 300 feet wide to the park. In the same year was authorized the construction of the Torresdale Boulevard, 300 feet wide and 15 miles long, from North Broad Street to Torresdale. Of note are the statues of Lincoln, Garfield, Grant, Meade, Humboldt, Schiller, Goethe, Columbus, Joan of Arc, Witherspoon, and Father Mathew; and the Catholic Total Abstinence Union Fountain, and the Smith Memorial Arch. Grant's Cabin, occupied as headquarters at City Point, is here preserved. In the city proper are comparatively few works of art, the most important being statues of Washington in front of Independence Hall, of Franklin on the post-office pavement, and of McClellan and Reynolds on City Hall Plaza.

The Wissahickon Valley, a deep wooded ravine, which has been left almost in its original wild state, is of interest for its memories and legends of Indian braves and mystic German monks who made it their retreat. The first paper mill in America was erected on its banks in 1690. In Fairmount Park there are 20 small streams, several lakes, and more than 150 springs; over 66 miles of drives, 10 of bridle paths, and 40 of smaller roads. The boundary line is 30 miles long. The entire cost approximates $7,000,000, and $3,500,000 has been expended in permanent improvements.

The Laurel Hill cemeteries are contiguous to the park. In the city are numerous burial places, many of historic associations.

Educational Institutions and Libraries. At the close of 1902 there were in the city six higher schools, including a high school for boys, conferring degrees of A.B. and B.S., and a school of pedagogy; a high school, a commercial high school, and a normal school for girls; and two manual training schools. There were also one school of industrial art, one elementary manual training school, one observation and practice school, five special schools for backward children and truants (under the compulsory education law), twelve cooking schools, and grammar, primary, and kindergarten schools, making the total of city institutions 420, with 229 male and 3537 female teachers, and an attendance of 158,473, of which 5800 were in the higher schools. The general course of study falls under no classification, but is the result of development. Foreign languages are taught only in the higher schools. There is some special and experimental manual training for seventh and eighth grade boys, and cooking and sewing instruction for sixth, seventh, and eighth grade girls. Through private bequest and municipal legislation there are available 358 free scholarships in the University of Pennsylvania, Bryn Mawr, Lehigh University, and various medical, art, and scientific colleges. Night and summer vacation schools are conducted.

At the head of the higher educational institutions is the University of Pennsylvania (q.v.). Philadelphia is a centre of medical education, its prominent medical colleges being that of the University of Pennsylvania, Jefferson, Hahnemann, Medico-Chirurgical, Polyclinic, and Woman's (founded in 1850), the first chartered medical college for women in the world to confer the degree of M.D. The Pennsylvania and Philadelphia dental colleges (the oldest and the best of their kind) and the Philadelphia College of Pharmacy are largely attended. The art schools of the Pennsylvania Academy also are the oldest in the country. The School of Industrial Art and the School of Design for Women are well known. Bryn Mawr College (q.v.), near Philadelphia, is one of the foremost women's institutions of the United States. The Drexel Institute, founded and endowed with $2,000,000 by A. J. Drexel, offers at a small cost courses in art, sciences, and industrial training. Other leading institutions are the Franklin and Spring Garden Institutes, Temple College, Episcopal Academy, the seminaries of the Protestant Episcopal, Lutheran, and Roman Catholic churches, La Salle and Saint Joseph's Colleges, and the Roman Catholic High School, the Methodist Episcopal Collegiate Institute for Girls, numerous schools of the Society of Friends, including the William Penn Charter (1701), the first chartered school in the country, the Cheltenham Military Academy, and the Germantown Academy (1760). The Williamson Free School of Mechanical Trades, established under a bequest of $2,500,000 by the late I. V. Williamson, offers complete trade courses and supports students free of cost. Philadelphia is noted for its associations and institutions for the promotion and diffusion of science and learning, and the encouragement of art. Among these are the Philadelphia Academy of Natural Sciences (q.v.), the Franklin Institute (q.v.), the American Philosophical Society, the American Academy of Political and Social Science, the Historical Society of Pennsylvania, the Zoölogical Society, the Numismatic and Antiquarian Society, the Pennsylvania Academy of Fine Arts, and the Wagner Institute.

The Free Library, now in temporary quarters, founded in 1891, on bequests of George S. Pepper and others, is maintained by appropriations made by City Councils. In the central and 14 branch libraries are over 250,000 volumes. A gift by Andrew Carnegie of $50,000 for each of thirty additional branches with halls for public gatherings (conditional upon their maintenance by the city), and an appropriation of $1,000,000 for a permanent central building, provided by a loan approved by popular vote, are awaiting expenditure. The Library Company's collection, begun in 1731 by Benjamin Franklin and his associates of the 'Junto,' formed the first subscription library in America. Its 200,000 volumes include many of extreme rarity. The Ridgway Branch, an excellent example of pure Greek architecture, contains one of the most valuable reference lists in the United States. Other important libraries

of the 100 in the city are the Mercantile (1821), general circulation and reference; Carpenters' Company (1756), architecture and building; Friends' (1742); American Philosophical Society (1743); Academy of Natural Sciences; Franklin Institute, scientific; Hurst, law; College of Physicians; University of Pennsylvania, Apprentices', Pennsylvania, Presbyterian, and Baptist Historical societies; Drexel Institute; and the H. Josephine Widener Branch of the Free Library, with a valuable collection of reference works.

Hospitals and Other Institutions. The municipal charities are the hospitals for the Indigent and for the Insane, General Hospital, and the Municipal Hospital (contagious diseases). The Pennsylvania Hospital, founded in 1751, through the efforts of Franklin, and maintained entirely by private subscription, is the oldest institution of the kind in America. The religious denominations maintain institutions, among them being Saint Agnes', Saint Mary's, and Saint Joseph's hospitals (Roman Catholic); Episcopal, Methodist, Presbyterian, Jewish, Saint Luke's (Baptist), and German (Lutheran) hospitals. Large hospitals are connected with the University, and Jefferson, Medico-Chirurgical, Polyclinic, Hahnemann, and Woman's Medical colleges. Other important charities are the Rush and Phipps hospitals for consumptives, the Gynecean, Orthopaedic, Wills Eye, and Maternity hospitals. There are more than 100 dispensaries, homes, asylums, orphanages, etc. The College Settlement, Society for Organizing Charity, Working Women's Guilds, Flower, Fruit, and Ice Mission, various children's aid, protection, and country week associations do good work. The city maintains numerous public baths, which were patronized in 1902 by 4,153,000 persons.

Girard College, founded by Stephen Girard, who at his death in 1830 gave $2,000,000 for construction and the greater portion of his $5,000,000 estate for endowment, supports and educates annually over 1600 orphans. The residuary fund now amounts to $16,500,000. The Citizens' Permanent Relief Committee has relieved thousands of distressed in all parts of the world, over $5,000,000 having been distributed since 1879. The Mayor is president. The penal institutions are the Eastern State Penitentiary, the House of Refuge (boys and girls), the House of Correction (adults), and Moyamensing and Holmesburg County prisons.

Theatres and Clubs. The drama in America began in Philadelphia, a company being organized in 1749. The first permanent playhouse in the city was built in 1766; a portion of its walls still stands. The Walnut Street Theatre is the oldest in the country. At Locust and Eighth streets stands the Musical Fund Hall, where Malibran, Jenny Lind, and Ole Bull appeared. Other important playhouses are Keith's New Theatre, the Garrick, the South Broad, the Chestnut Street, the Grand and Chestnut Street opera houses, and the Auditorium. The Academy of Music, with a capacity of 4000, is used for large public gatherings.

Leading clubs are the Union League, with a handsome brownstone building; Philadelphia, Manufacturers', Mercantile, Rittenhouse, Markham, Columbia, University, Penn, Art, installed in a beautiful Renaissance [illegible] of Pompeian brick and Indiana limestone; Sketch, Lawyers' Clover, Five o'Clock, Maennerchor, Franklin, Country, Pen and Pencil, Philadelphia Yacht, and the New Century and Acorn (women's).

Commerce and Manufactures. The industrial development of Philadelphia has been greatly aided by the favorable location of the city for commerce, and especially by its proximity to raw materials. The city has the advantage of superior railroad facilities. The great Pennsylvania Railroad system, with 10,484 miles of owned and leased lines, and the Philadelphia and Reading Railway, with $140,000,000 capital and 1457 miles of track, terminate and have home offices near the City Hall. The Pennsylvania lines give Philadelphia more direct communication with the productive Middle West than is enjoyed by any other Atlantic port. The general offices of the Lehigh Valley Railroad are in the city. The Baltimore and Ohio enters where Chestnut Street crosses the Schuylkill. The tracks of the Pennsylvania are nearly all elevated or below grade, the Baltimore and Ohio below, and the Reading partly above, partly below, but mainly at grade. The Delaware River admits of the entrance of ocean vessels, and is navigable the entire length of the city's frontage, 18 miles. Work is now in progress to deepen the river to 30 feet. The Schuylkill River is navigable eight miles for vessels of light draught and is being dredged to a depth of 22 feet. The general export and import interests, including the Port Richmond coal wharves, are located mainly on the Delaware. Eleven transatlantic lines enter the port.

Early in the nineteenth century Philadelphia was first among United States ports in foreign commerce, but its relative importance declined, until in 1901 it ranked fourth. The imports for that year were valued at $48,043,443, and the exports at $79,354,025. In 1901, 158 sailing vessels, with an aggregate of 115,779 tons, and 950 steam vessels, of 1,807,623 tons, entered the port. The pipe lines of the Standard Oil Company from the wells in the northwest section of the State terminate at Point Breeze, on the Schuylkill, and oil is one of the largest and most valuable shipments of the port. In 1901 the exports of illuminating mineral oil amounted to 207,111,311 gallons, valued at $12,323,961. The exports of corn for the same year amounted to $12,633,467, one-seventh of the total for the country. Wheat and flour are also exported extensively. In 1901, 37,833 head of cattle were shipped, and there were also considerable exports of meat and meat products. Coal and copper are other important exports. The largest import is sugar, amounting in 1901 to a value of over $15,500,000. Imports of unmanufactured silk were valued at over $8,000,000. Among other leading imports are goat skins, fabrics, bananas, etc.

Philadelphia is a great manufacturing centre, ranking third in the United States in value of products. Of 15 selected industries in the census year 1900, it was first in one (leather), second in two (cigars and cigarettes, and women's factory clothing), and third in six. The value of the total output was $732,137,957. This was nearly double the corresponding figure for 1880, but the greater part of the increase was made in the decade 1880-90. The manufacture of foundry and machine shop products is most important, amounting in 1900 to $38,372,971. In this industry Philadel-

phia has a special advantage, owing to its proximity to abundant resources of coal and iron. It is noted particularly for the manufacture of locomotives, the Baldwin Locomotive Works, on North Broad Street, having a yearly capacity of 1500. For years Philadelphia has been the foremost shipbuilding centre in the country. Many warships of the United States and also a number for foreign governments have been built at the Cramp shipyard, which occupies some 52 acres in the Port Richmond section. These two establishments are not only the leading ones of Philadelphia, but each excels, in its own line, for the country at large. In the total manufacture of textiles also the city ranks first (though not for any one branch), the value of the principal textiles produced in 1900 being as follows: Woolen goods, $18,340,012; worsted goods, $16,242,250; cotton goods, $15,723,654; hosiery and knit goods, $13,040,905; silk and silk goods, $4,531,794. The output of the sugar and molasses refining industry was valued at over $36,000,000; the output of clothing, $28,000,000; of carpets and rugs, nearly $22,000,000; of leather, nearly $20,000,000; and of liquors, over $12,000,000.

Government. The executive branch of the government is of a dual nature, consisting of county and municipal departments. The municipal form of government is provided for by the Bullitt Bill, act of June 1, 1885, amended April, 1903, the basic elements of which are concentration of authority in the mayor and the distinction between the executive and legislative functions. The executive departments are: Public Safety, which includes bureaus of police, fire, electricity, corrections, boiler inspection, building inspection, and city property; Public Works, which includes bureaus of water, highways, gas, lighting, street cleaning, surveys, ice boats, and filtration (temporary); Law, Education, Public Health and Charities, Receiver of Taxes, City Comptroller, and City Treasurer (ex-officio County Treasurer), and Supplies. The mayor, who is elected every four years and is ineligible for succession, appoints directors of the Departments of Public Works, Safety, Health, and Supplies, subject to confirmation by Select Council. Directors appoint chiefs of bureaus and other employees under civil service requirements. The receiver of taxes, city treasurer, city comptroller, and city solicitor are elected by popular suffrage. The Department of Education consists of 42 comptrollers, appointed by the judges of the Courts of Common Pleas. The Sinking Fund Commission consists of the mayor, city comptroller, and one member elected by Councils. The commissioners of Fairmount Park and members of the Board of Revision of Taxes, and the Board of City Trusts, in charge of Girard College and Estate and minor trusts, are also appointed by the courts. Sixteen port wardens are elected by the Councils. The county officials are commissioners in charge of elections, etc., treasurer, recorder of deeds, register of wills, clerk of the Court of Quarter Sessions, coroner, sheriff, and district attorney. The legislative function is exercised by Select and Common Councils, the former consisting of one member from each of 42 wards, the latter of one member for every 4000 voters. Select Councilmen serve three years, and Common Councilmen, two, without pay. The veto power is vested in the mayor, a three-fifths vote enacting over it. The judiciary consists of police magistrates (limited civil and preliminary criminal actions); judges of the Courts of Common Pleas (civil), who are also judges of the Courts of Quarter Sessions (criminal); and the judges of the Orphans' Court (estates). The Superior and Supreme Courts of Pennsylvania and the United States District and United States Circuit Courts sit in the city.

The city has leased its gas-works for a maximum period of 30 years, expiring December 31, 1927. Electric lighting is supplied by a private corporation. The water-works are under municipal ownership. A system of slow sand filtration is being installed, and in August, 1903, when upward of $17,000,000 was involved in contracts, it was over half finished and in partial operation. The complete works, with a daily capacity of 300,000,000 gallons, are estimated to cost $26,000,000.

Finances. The city's receipts for 1902 were $33,520,729. The important items were: taxes, $16,793,680; gas, $486,491; State appropriation (1901-02) for schools and teachers' annuities, $316,000; loans negotiated, $6,915,000; personal property tax, $1,249,332; permits, fees, etc., $7,400,000, including water rents, $3,422,000, liquor licenses, $1,766,000, and premiums on loans, $581,030; interest, $365,000. The expenditures were $34,605,948; the largest item was $25,904,693 for municipal departments and bureaus; of this amount schools received $4,186,000; police, $3,565,000; fire, $1,124,000; water, $6,511,000; highways, $2,109,000; street cleaning, $1,238,000. Other large disbursements were: interest on funded debt, $1,404,036; several sinking funds, $1,727,787; loans redeemed, $680,000; mandamuses, $1,456,105. The general cash balance on January 1, 1903, was $17,166,865. The gross debt at the same date was $59,361,845; the city loans held by the sinking fund amounted to $6,645,300, leaving a net city debt of $52,716,545; the total assets were $29,132,473, not including the real estate owned by the city, valued at $64,520,994. The assessed real estate valuation, as estimated in August, 1903, for 1904, was $1,160,392,710. Under the law the debt is limited to 7 per cent. All permanent loans after the 2 per cent. point has been exceeded must be authorized by a vote of the people.

Population. The population in 1900 was 1,293,697, Philadelphia ranking third among American cities. Since 1854 no territory has been added to the municipal limits. The percentage of increase from 1880 to 1890 was 23.58, and from 1890 to 1900, 23.57. Fifty-four and seven tenths per cent. of the white population is of foreign parentage, but native whites of foreign birth comprise 32 per cent. of the entire population. The negroes numbered 28,940 in 1900; Chinese, Japanese, and Indians, 1277. The largest classes of European descent are German, Irish, English, and Italian. French, Greeks, Armenians, Russians, Bohemians, and Poles are present in much lesser numbers. Though some tendency to congregate is shown, there are few well defined foreign colonies. In 1800 the population of Philadelphia was 28,522; in 1820, 63,802; in 1840, 93,665; in 1860, 563,529; in 1880, 847,170; in 1890, 1,046,964.

History. The first settlement (called Wicaco) within the present limits of Philadelphia was made in 1636 by a company of Swedes sent out by the Government of Queen Chris-

tin. On October 7, 1681, Captain William Markham, Deputy Governor for William Penn, arrived with a small company, and started an English settlement here, which in July of the following year was laid out and called Philadelphia, 'the city of brotherly love.' In 1683 a company of Germans, invited hither by Penn, arrived and settled at Germantown, within the present city limits. In 1684, immigration having been rapid from the start, there were 300 houses and more than 2500 inhabitants. The majority of the early settlers were Friends, and their influence, combined with that of the Germans, predominated for many years and greatly affected the course of Pennsylvania's history. Penn returned to England in 1684, and did not revisit the city until 1699, when he found a population of 4500, and 700 houses. He chartered the city in 1701, and thereafter frequent controversies arose between the people and the Penn family over proprietary privileges, especially as regards taxation of the Penn lands. The first English school was opened in 1683. Franklin's *Pennsylvania Gazette* began publication in 1729 and the *Pennsylvania Journal and Weekly Advertiser* was started in 1742. In 1741 the city, then having 1621 taxable citizens, was divided into ten wards. In 1723 Benjamin Franklin, who, next to Penn, exerted the greatest influence in the history of the city, came to Philadelphia. In 1747, during King George's war with the French and Indians, the publication of his *Plain Truth* roused a spirit of military enthusiasm, a force of 10,000 was raised in Pennsylvania, and a battery was erected below the city, on the site of the present United States Navy Yard. In 1751 the first line of packets to New York was established, followed in 1756 by a stage line. Under Franklin's influence, in 1747 the merchants of Philadelphia sent a ship to discover the Northwest Passage. In 1755 a militia bill was passed, and Franklin became colonel of the city regiment.

From 1763 to 1774 Philadelphia was prominent in resisting British aggression, though the Loyalist party was strong, and most of the Friends opposed warfare; and here most of the important official events of the Revolution took place. In 1773 (October 17), during the excitement over the expected arrival of the tea ships, the people met in mass meeting and passed resolutions which, on November 5th, were readopted at Boston. The first Continental Congress met in Carpenter's Hall, September 5, 1774; the second met May 10, 1775, in the State House; and there, on June 15th, Washington was appointed commander-in-chief of the Continental army. In 1776 Congress met for the third time in the State House, and there, on July 4th, the Declaration of Independence was adopted. Philadelphia was held by the British from September 27, 1777, to June 18, 1778, and during this period, while the American army was at Valley Forge, was the scene of much gayety. On May 18, 1778, the famous entertainment called the Mischianza (q.v.) was given in honor of General Howe, who was about to depart for Europe. On October 4, 1777, the battle of Germantown (q.v.) was fought. On May 2, 1787, delegates from the different States assembled here, and, after almost four months of debate behind closed doors, adopted a Constitution for the United States, September 17th. On March 11, 1789, the city received a new charter from the legislature. Epidemics of yellow fever in 1793 and 1798 caused great loss of life, at least 4000 dying in the former year and almost 5000 out of the 30,000 who remained in the city in the latter.

During the latter part of the eighteenth century and the early part of the nineteenth Philadelphia was the most important city in America. The historian McMaster says of it in 1784: "The city was then the greatest in the country. No other could boast of so many streets, so many houses, so many people, so much renown;" and Liancourt describes it in 1800 as "not only the finest city in the United States, but . . . one of the most beautiful cities of the world." Philadelphia was the capital of Pennsylvania from 1683 until 1799, the seat of the Federal Government from 1790 to 1800, and the monetary centre of the country until 1836. (See BANK, BANKING.) For many years, also, it was the intellectual and literary centre of the country. Here were published the first newspaper in the middle colonies, *American Weekly Mercury* (1719); the first secular magazine in North America, *Ein geistliches Magazin* (1764); the first daily newspaper in the United States, the *Pennsylvania Packet* (1784); the first American edition of the Bible in German (1743), and in English (1781), and the first religious weekly, *Religious Remembrancer* (1813). The most popular of the early American magazines—the *Port Folio* and the *Analectic*—were also published here.

Philadelphia took the lead in the early anti-slavery movement, the first formal protest against slavery in this country being made by four Germans of Germantown in 1688, the first Abolition convention being held here January 1, 1794, on the invitation of the Pennsylvania Abolition Society, and the American Anti-Slavery Society being founded here, under the leadership of Garrison, in 1833. In 1812 the water-works at Fairmount were begun and were finished in 1815. In 1832 nearly 1000 deaths resulted from Asiatic cholera. In May, 1838, an anti-Abolitionist mob destroyed Pennsylvania Hall, in which an Abolitionist meeting had been just held. In 1844 occurred the anti-Catholic riots, arising from the demand of the Catholics to be permitted to use the Douai instead of the King James Bible in the public schools. The anti-Catholics, or 'Native Americans,' burned Saint Michael's and Saint Augustine's churches, and caused much loss of life before they were put down by the militia. Gas was introduced in 1836, and the first telegraph line was established in April, 1846. On February 2, 1854, a consolidation act was passed by the Legislature, extending the city limits to the county boundaries, and uniting under one municipal government all the outlying districts, known as Southwark, Northern Liberties, Kensington, Spring Garden, Moyamensing, Penn, Richmond, West Philadelphia, and Belmont; also the boroughs of Germantown, Manayunk, and other townships. Philadelphia took an active part in the Civil War, and raised more than $1,000,000 by a sanitary fair in 1864. The centenary of American independence was celebrated in 1876 by the Centennial Exposition; the bi-centennial of the landing of William Penn in 1882; and the centennial of the signing of the Constitution in 1887.

BIBLIOGRAPHY. Hazard (editor), *Watson's Annals* (Philadelphia, 1884); Scharf and West-

cott, *History of Philadelphia, 1609-1884* (ib., 1884); Allinson and Penrose, *Philadelphia, 1681-1887* (ib., 1887); Trades League, *The Book of Philadelphia*, 1894 (ib., 1894); Repplier, *Philadelphia, the Place and the People* (New York, 1895); Young, *Memorial History* (ib., 1895); Fisher, *The Making of Pennsylvania* (Philadelphia, 1896); id., *Chapters in Pennsylvania, Colony and Commonwealth* (ib., 1897); Rhoades, *The Story of Philadelphia* (New York, 1900); King, *Philadelphia and Notable Philadelphians* (ib., 1902).

PHILADELPHIA ACADEMY OF NATURAL SCIENCES. An association founded in 1812 for the purpose of furthering the study of the natural sciences and encouraging original investigation in the various fields of physical research. It is the oldest organization in the United States devoted to the encouragement of natural science. Its museum is especially rich in ornithological specimens and fossils, while its collection of shells is the finest in the world. The Jessup foundation provides gratuitous training for a number of young investigators. The society has published a *Journal* since 1817 and its *Proceedings* since 1841.

PHIL'ADELPH'US (Neo-Lat., from Gk. *φιλάδελφον, philadelphon*, sort of flowering shrub, perhaps jasmine; named in honor of Ptolemy Philadelphus, King of Egypt). A genus of shrubs of the natural order Saxifragaceæ. Several species are natives of the southern Atlantic and Pacific States and Japan. *Philadelphus inodorus* grows in the mountains from Virginia southward. *Philadelphus grandiflorus* grows in lower ground in the same region. *Philadelphus hirsutus* grows in Tennessee and North Carolina. *Philadelphus Gordonianus* and *Philadelphus Lewisii* are natives of the Pacific Coast States. The most common and best representative of the genus, however, is *Philadelphus coronarius*, the common mock orange or syringa, much cultivated in gardens. Its native country is not known, but it was probably brought from Japan to Southern Europe, where it appears to be indigenous. It has erect branches, oblong ovate leaves, which when crushed have very much the odor and taste of cucumbers. Its cream-colored flowers, borne in large clusters, are well known for their exceeding fragrance.

PHI'LÆ (Lat., from Gk. *Φιλαί*, Coptic *Pilâkĕh*, the corner, extremity, i.e. of Egypt). A celebrated island in the Nile, just above the First Cataract, in latitude 24° 1′ N. It is a small granite rock, about 1000 feet long by 500 feet broad, and is covered with ancient buildings of great architectural beauty and interest. By the Arabs it is called *Gezîret Anas el-Wogûd*, 'The island of Anas el-Wogûd,' from the name of the hero of a tale in the *Thousand and One Nights*, the scene of which is laid here. Philæ is not mentioned in the Egyptian inscriptions before the time of Nectanebo II., who constructed the oldest of the buildings that now remain, though it is reasonably certain that a temple existed there in earlier times. The island was especially devoted to the worship of the goddess Isis, but Osiris, Hathor, Khnum, Satet, and other divinities were also worshiped there. In later times, when the cult of Isis had spread through the Greek and Roman world, many pilgrims of foreign nationality visited the shrine of the goddess at Philæ, and her worship was maintained there long after heathenism had been banished from other parts of Egypt. The great temple of Isis was built by Ptolemy Philadelphus and his successor, Euergetes I., but additions and embellishments were made by other Ptolemies and by several of the Roman emperors. The approach to the temple is formed by the dromos, a long open space, flanked on its eastern and western sides by colonnaded walks. At the southern end is the hall of Nectanebo II., built about B.C. 350, and near it to the right is the ruined temple of the Nubian deity Arnuphis (Ar-hes-noter). Starting from this temple, the eastern colonnade runs northward to the small temple of Imhotep (Asklepios), and terminates near a gate built by Ptolemy Philadelphus and adorned with reliefs by that monarch and by the Emperor Tiberius. The western colonnade is pierced by a number of windows which give a fine view over the river. It runs along a fine stone quay of ancient construction. At the northern end of the dromos stands the great pylon of Nectanebo II., leading into the outer court, on the eastern side of which are a number of chambers, built for the use of the priests, while on the western side is the birth-house, commemorating the birth of Horus. Among the reliefs and inscriptions upon the walls of the latter building is a copy in hieroglyphic and demotic of the text of the Rosetta stone (q.v.). At the upper end of the outer court is a second pylon, which gives entrance to the inner court leading to a columned hall, and from this, through a succession of smaller halls and chambers, lies the way to the sanctuary of the goddess Isis and her son Harpocrates (q.v.). In an upper story is a room decorated with scenes from the myth of Osiris (q.v.). The temple is decorated throughout with sculptures and reliefs which are well preserved and are richly colored. West of the temple of Isis, near the river, are a gate built by the Emperor Hadrian and the temple of Harendotes (Egyptian *Har-ne-tawy*, 'Horus the avenger of his father'). On the eastern side of the island is the small temple of Hathor built by Ptolemy Philometor and Euergetes II., and near it, close to the river bank, is a beautiful pavilion resting upon light and graceful columns and richly adorned with reliefs. On the northern end of the island, among the ruins of the ancient city of Philæ, are the remains of the old Roman city gate, of the temple of Augustus, and of a Coptic church. It was expected (1903) that the great dam at Assuan would so raise the level of the Nile at Philæ as to submerge the island. Consult: *Description de l'Egypte* (Paris, 1820-30); Lepsius, *Reisebericht aus Aegypten* (Leipzig, 1855); Edwards, *A Thousand Miles Up the Nile* (London, 1877); Dümichen, *Geschichte des alten Aegyptens* (Berlin, 1878); Mariette, *Monuments of Upper Egypt* (London, 1877); id., *Voyage dans la Haute-Egypte* (Paris, 1893); Baedeker, *Aegypten* (4th ed., Leipzig, 1897). See Plate accompanying article EGYPTIAN ART.

PHILANDER. A Dutch knight in Ariosto's *Orlando Furioso*, who made love to Gabrina, the wife of his host. His name is used as the synonym of a male coquette in various plays, and is the origin of the verb to philander.

PHILANTHROPY (Lat. *philanthropia*, from Gk. *φιλανθρωπία*, love of humanity, from *φιλάνθρω-*

πος, *philanthrōpos*, loving humanity, from φιλεῖν, *philein*, to love + ἄνθρωπος, *anthrōpos*, man). In German educational history, a term applied to the theories of a group of men who based their educational theories upon Rousseau. At the head of these was Basedow, who founded an institution, the Philanthropinum, at Dessau in 1774. The only survival of the movement is Salzmann's institution at Schnepfenthal in Gotha, founded in 1784. See BASEDOW.

PHILARET, fĭl'ȧ-rĕt (VASILI FEODOROVITCH DROSDOFF) (1783-1867). Metropolitan of Moscow. He was born at Kolomna; became a priest in 1808 and in 1812 was made rector of the Theological Academy of Saint Petersburg. In 1817 he became Bishop of Revel, in 1819 Archbishop of Tver and a member of the Holy Synod. In 1820 he was transferred to Yaroslav and in 1821 to Moscow. He was appointed Metropolitan of Moscow in 1825. He was noted for learning and eloquence, and drew up the manifesto which led to the abolition of serfdom. He prepared a longer and a shorter catechism, both of which were adopted and promulgated by the Holy Synod in 1839, and the former is considered the most authoritative doctrinal standard of the Graeco-Russian Church. Both catechisms have been translated into English by Blackmore in *The Doctrine of the Russian Church* (London, 1845); Blackmore's translation of the longer catechism is reprinted in Schaff, *The Creeds of Christendom*, vol. ii., pp. 445-542. There has also been published a volume of Philaret's *Select Sermons* in English translation (London, 1873), with brief biography. He began a translation of the New Testament into Russian, which was completed after his death.

PHILASTER, OR, LOVE LIES A-BLEEDING. A tragedy by Beaumont with some assistance from Fletcher. G. C. Macauley considers it the work of Beaumont alone. It was printed probably in 1608, and printed in 1620. Several versions were produced, one as late as 1764.

PHIL'ATEL'IC ASSOCIATION (from Gk. φίλος, *philos*, loving, from φιλεῖν, *philein*, to love + ἀτελής, *atelēs*, free of tax, prepaid, from α-, *a-*, not + τέλος, *telos*, tax, duty), AMERICAN. A national society of postage stamp collectors, founded in 1885, meeting annually in such cities as may be selected, and having local branch societies in New York, Chicago, Pittsburg, and Saint Paul. It has a membership of nearly six hundred, and its objects are to bring together those interested in philately, and to study that subject with the help of exhibitions of collections.

PHILATELIC SOCIETY OF LONDON. An English association of collectors of postage stamps, founded in London in 1869, the first of its kind. Its objects are the study of postage stamps, their history and manufacture, the detection of forgeries, the exhibition of stamps, and the publication of works on these subjects. The membership includes many collectors in the English colonies and on the Continent. The society has conducted two international philatelic exhibitions. It has also published expensive volumes on the stamps of Great Britain, of the British colonies, of India and Ceylon, and of Africa, and issues its proceedings in the *Monthly Journal*.

PHILAT'ELY. See POSTAGE STAMPS.

PHIL'BRICK, JOHN DUDLEY (1818-86). An American educator, born in Deerfield, N. H. He graduated at Dartmouth in 1842 and afterwards taught in Boston for ten years. In 1853 he became principal of the Connecticut Normal School, and in 1855 superintendent of schools in that State. From 1857 to 1874 and again from 1876 to 1878 he was superintendent of the Boston public schools. He was sent to the Vienna Exposition of 1873 as educational commissioner from Massachusetts, and acted as a member of the international jury. After his return he became president of the National Teachers' Association and was officer of many educational societies. He prepared a valuable report on the *City School Systems in the United States* (published by the United States Bureau of Education in 1885) and edited the Connecticut *Common School Journal*, and the *Massachusetts Teacher*.

PHILEL'PHUS. The Latinized form of the name of the Italian humanist Francesco Filelfo (q.v.).

PHILE'MON (Lat., from Gk. Φιλήμων) (c.361-263 B.C.). A Greek comic poet. He was a native of Soli, in Cilicia, or of Syracuse, in Sicily. He resided chiefly in Athens, but for a time also in Alexandria at the Court of Ptolemy Philadelphus. He and Menander were the two representative poets of the Attic New Comedy. Philemon gained more prizes than Menander, perhaps through bribery of the judges. Posterity, however, reversed the decision, and Menander and Homer were the two favorite poets of later Greece. Of the 97 comedies which Philemon left, 57 are known to us from titles and fragments, while two at least, the Ἔμπορος and Θησαυρός, are preserved in Plautus's adaptations, the *Mercator* and *Trinummus;* and it is also probable that Plautus's *Mostellaria* follows Philemon's Φάσμα. The fragments are published by Koch, *Comicorum Atticorum Fragmenta*, vol. ii. (Leipzig, 1886).

PHILEMON. A dear friend of the Apostle Paul, to whom he wrote the letter which is now preserved in the New Testament under Philemon's name. From this letter it appears that he was a rich man who probably lived at Colossæ, owned slaves, was noted for his hospitality, and had become a Christian under Paul's influence. There are legendary accounts of Philemon's later accession to the Bishopric of Colossæ and of his martyrdom there under the Emperor Nero.

PHILEMON, EPISTLE TO. One of the Epistles of the New Testament and the only letter of Paul written to an individual on a purely private matter which has been preserved. In it Paul appeals to his friend Philemon in behalf of Onesimus, a fugitive slave, who, under the influence of Paul, had become a convert to the Christian faith. This fugitive Paul sends back to his master with a letter praying for the culprit's pardon and even hinting at emancipation. The letter was, almost without doubt, written from Rome, some time after Paul's arrival there in the spring of A.D. 59. The most significant value of the letter is its bearing upon the question of human slavery. The practice is not condemned, but the new doctrine of the brotherhood of man is emphasized as in the Colossian and Ephesian letters, written at the same time. Consult: Ellicott, *Philippians, Colossians, and Philemon* (Andover, 1865); Lightfoot, *Colossians and Philemon*

(1876); Soden in *Hand-Commentar zum Neuen Testament*, vol. iii. (Freiburg, 1893); Moule, *Colossians and Philemon* (*Cambridge Bible for Schools and Colleges*, Cambridge, 1894); Vincent, *Philippians and Philemon* (*International Critical Commentary*, New York, 1897); Maclaren, *Colossians and Philemon* (*Expositor's Bible*, New York, 1903).

PHILEMON AND BAU'CIS. According to a myth related by Ovid in his *Metamorphoses*, a pair of poor Phrygian peasants. Jupiter and Mercury, wandering through Phrygia in human form, were hospitably entertained by them, when all the neighborhood had turned the wanderers from their doors. On going away the gods took them with them to a neighboring mountain, whence they saw their village covered with a flood, but their own cottage changed into a splendid temple. Jupiter permitted them to make any request they chose, but they only asked to be servants of his temple and to die at the same time. Therefore in their extreme old age the gods transformed Philemon into an oak, Baucis into a linden, which long stood in front of the temple, and were honored by the people. The story, which has been much elaborated by Ovid, contains two elements common in popular tales: the rescue from a flood by divine interposition and the reward for hospitality to supernatural visitors in disguise. The vitality of the legend in Phrygia seems emphasized by the experience of Paul and Barnabas at Lystra (Acts xiv.).

PHILE'TAS (Lat., from Gk. Φιλήτας) OF COS. A Greek grammarian and poet who lived about the close of the fourth century B.C., tutor to Ptolemy II. Philadelphus of Alexandria. His poems, which were chiefly elegies devoted to the praises of his mistress, Battis, were ranked next to those of Callimachus by the Alexandrian critics, and were imitated by Propertius. He wrote also epics and grammatical treatises. The scanty fragments that remain have been published by Bach (1829). Consult Weber, *Elegischen Dichtern des Hellenen* (Frankfurt, 1826).

PHILHARMONIC SOCIETIES (from Gk. φιλεῖν, *philein*, to love + ἁρμονία, *harmonia*, harmony). Organizations formed for the cultivation of orchestral music. The four most important are those of London, New York, Vienna, and Berlin.

LONDON. This is the oldest association of orchestral performers in England. In 1813 a number of music-lovers founded the Philharmonic Society and the first concert was given March 8th of that year. According to the constitution only concerted pieces were to be performed; all solo and concertos were excluded. But when a little later some of the members formed quartets the society ceased to perform chamber-music at its concerts and restricted itself to instrumental works for orchestra. In 1820 the term *conductor* (q.v.) appears for the first time upon the programmes, and it designated the person at the piano. After 1821 the conductor stood before the orchestra and directed by means of a baton. Since 1869 the organization has published analytical programmes for its concerts, at which the most eminent instrumental and vocal artists of their time have appeared.

NEW YORK. The Philharmonic is the oldest permanent orchestral association in New York. It was founded in 1842, the first concert taking place December 7th of that year. From the beginning it consisted of professional musicians only. As an educational factor the Philharmonic Society has been of greater importance in the musical life of America than any other organization, with the possible exception of the Boston Handel and Haydn Society. (See CHORAL SOCIETIES.) Up to 1865 various members of the orchestra acted as conductors. Beginning with that year a conductor for the season was chosen, the first being Carl Bergmann, who directed the concerts until 1876. After Dr. Damrosch had been conductor for one season, Theodore Thomas held the post from 1877 to 1890. This eminent director was succeeded by Anton Seidl. From 1898 to 1902 Emil Paur was conductor, and this period was marked by the production of an unusual number of new works, especially of the Neo-German school. In 1902 Walter Damrosch was conductor. The orchestra numbers over one hundred performers. Eight concerts take place on Saturday nights, each being preceded on Friday afternoons by a public rehearsal, which, in reality, is a regular concert, having its own list of subscribers.

VIENNA. The society, known as *Philharmonische Gesellschaft*, was founded in 1842 by Otto Nicolai, at that time conductor at the Imperial Opera. As the *Gesellschaft der Musikfreunde* (q.v.) was fast degenerating, there was a positive need of an organization that would give artistic performances. The first concert of the new society took place November 27, 1842, and the venture immediately met with great favor and financial success. The programmes consisted generally of two symphonies with smaller works. Instrumental solos, however, were not permitted. When Nicolai accepted a position in Berlin in 1847 the *Philharmonische Gesellschaft* almost came to an end. In fact, no concerts were given from 1850 to 1854. Then Carl Eckert reorganized the orchestra, and in 1860 the energetic otto Dessoff succeeded in bringing the orchestra to a high degree of perfection. Since then the *Philharmonische Concerte* have stood always for musical progress. The conductor in 1902 was Hans Richter, under whose leadership the society has established its reputation as one of the foremost orchestral institutions of the world.

BERLIN. The Berlin Philharmonic Society was founded by Edward Rietz (1802-32). This orchestra at first consisted of about forty instruments, but the number was subsequently increased and the organization now ranks with the best orchestras of Europe. Its concerts are given in the 'Philharmonie.' An innovation is its series of popular concerts given three times a week during the winter.

PHILHELLENES, fil-hĕl'lēnz (from Gk. φιλέλλην, *philellēn*, friend of the Greeks, from φιλεῖν, *philein*, to love + Ἕλλην, *Hellēn*, Greek). A name given to the friends of the Greeks in their struggle for independence. They were constituted into associations for the purpose of receiving and distributing gifts in aid of those engaged in the contest. The members came from all countries, including such men as Byron, King Louis I. of Bavaria, and a body of volunteers who fought for the Greeks under the leadership of General Normann-Ehrenfels.

PHIL'IDOR (1726-95). A famous French chess-player also known as a composer. His real name was François André Danican.

PHILINTE. fē'lant'. A character in Molière's *Misanthrope*, whose easy tolerance of the shortcomings of his fellows sets him in strong contrast to his friend Alceste.

PHIL'IP (Lat. *Philippus*, from Gk. Φίλιππος, Philip, loving horses, from *φιλεῖν*, *philein*, to love + *ἵππος*, *hippos*, horse). THE APOSTLE. One of the more prominent of the twelve disciples of Jesus. He was a fellow-townsman of Andrew and Peter and had been with them a follower of John the Baptist before he was called directly to become a disciple of Christ (John i. 43-44). When the company of the Twelve was definitely made up Philip became evidently one of their leading spirits, for his name stands in the lists at the head of the second of the three groups of four into which the Twelve are commonly divided. He does not figure extensively, however, in the records of the ministry of Jesus. His work after the death of Christ is involved in great confusion with that of Philip the Evangelist by the traditions. There are two apocryphal works bearing his name, the *Journeyings of Philip the Apostle* and the *Acts of Philip*. They are of slight historical value, however. Tradition of the safer sort assigns his labors to the region of Hierapolis in Asia Minor. The manner of his death and its date are both unknown.

PHILIP, THE EVANGELIST. One of those chosen by the first Christian church in Jerusalem to be the stewards of its charity to the widows and poor (Acts vi. 5). After exercising this office for a time he was engaged in missionary activity, which began after the death of Stephen. His initial work was among the Samaritans (Acts viii. 4-5). This was the first step outward from the limits of a Jewish cult for the new Christian faith. A second step in the process of widening the field was taken when Philip gave baptism to an Ethiopian eunuch (Acts viii. 26-40). Philip finally settled in the region of Cæsarea, on the coast of the Mediterranean, where he was found by Paul, who was entertained at his house (Acts xxi. 8). Tradition is not clear concerning his life after this, although there is pretty general agreement that he died a natural death at Tralles.

PHILIP II. (B.C. 382-336). King of Macedonia and father of Alexander the Great. He was born at Pella and was the youngest son of Amyntas II. and Eurydice. When a youth he was taken by Pelopidas as a hostage to Thebes, where he lived several years. After the murder of his eldest brother, Alexander, by Ptolemy Alcritas, he was appointed by his brother Perdiccas, when the latter, having slain Ptolemy, came to the throne, to the governorship of a separate district of the country. About B.C. 359 Perdiccas was slain in battle, while fighting with the Illyrians, and Philip assumed the government as guardian of his young nephew, Amyntas, the son of Perdiccas; but he soon set aside Amyntas and took the crown himself. At this time Macedonia was attacked on one side by the Illyrians, Pannonians, and other tribes, and on the other by the Athenians, while within she was torn by the dissensions of several pretenders to the throne; but, buying off the Thracians, who were supporting the pretender Pausanias; conciliating the Athenians, who had taken up the cause of another pretender, Argæus; killing or otherwise disposing of the remaining pretenders, and defeating in battle the threatening tribes, Philip in less than two years firmly established himself on his throne. Henceforward his policy was one of aggression, and the Greek towns on the coast of Macedonia were the first objects of attack. Amphipolis, Pydna, and Potidæa, Athenian possessions or allies on the coast of Macedonia, were the earliest places to fall into his hands. He then secured possession of the rich and valuable gold mines of Thrace, together with the town of Crenides, which he enlarged and called by the name of Philippi. These victories had all been obtained before 355; in 354 he took Methone, on the Thermaic Gulf, after a long siege, in the course of which he lost an eye, and then advanced into Thessaly, to aid the Aleuadæ against Lycophron, the tyrant of Pheræ. Defeating the force that was sent to oppose him, he established his supremacy throughout Thessaly and advanced as far south as the pass of Thermopylæ. The pass being guarded by a strong force of Athenians, who had been aroused by the eloquent warnings of Demosthenes, he returned and directed his arms against Thrace, where he succeeded in establishing his ascendency. In 349 he began his attacks on the Chalcidian cities, and in 347 completed the conquest of the Chalcidic peninsula by taking the city of Olynthus. In 346 he succeeded in gaining a further foothold in Greece, being called in by the Thebans to assist in the Sacred War against the Phocians. All the towns of Phocis, twenty-two in number, together with the pass of Thermopylæ, surrendered to Philip without resistance. The place which the Phocians had occupied in the Amphictyonic Council was transferred to him, and he was appointed, jointly with the Thebans and Thessalians, president of the Pythian games. In the following years he was again in Thrace, endeavoring to bring the cities in that country under his rule. He was unsuccessful in his attempt on Perinthus and Byzantium, and then turned his attention once more to the northern tribes. In B.C. 339 he was again invited into Greece, this time by the Amphictyonic Council, to take charge of the army that was to oppose the Locrians. Alarmed at his continued successes and his entrance into Greece, the Athenians formed a coalition with Thebes and other Greek States to oppose his advance, but the united army was utterly defeated at the battle of Chæronea in 338. This battle marks the end of Greek independence; Philip was now master of Greece. He at once began preparations for the invasion of Persia on a grand scale, and in 337, deputies from all the different States of Greece except Sparta assembling at Corinth, he was chosen commander-in-chief of the Greek forces. In the midst of his preparations, however, he was assassinated at Ægæ by a youth of noble blood named Pausanias, while attending a celebration in honor of the marriage of his daughter with Alexander of Epirus (B.C. 336). The motive for the deed, as stated by Aristotle, was private resentment for neglect on Philip's part to punish Attalus for a gross insult offered to Pausanias.

PHILIP III. A king of Macedonia. See ARRHIDÆUS.

PHILIP V. (B.C. 237-179). King of Macedonia, son of Demetrius II. and grandson of Antigonus Gonatas. He succeeded his uncle Antigonus Doson in 220. The first part of his reign was disturbed by the contentions of the Ætolian and Achæan Leagues; taking part with the latter, he conducted the war for several campaigns with ability and success. This war was called the Social War, and was concluded in 217, by the Peace of Naupactus. In 216-215 Philip was induced by the successes of Hannibal in Italy to conclude an offensive and defensive alliance with Carthage, the price of which was to be the Roman possessions in Illyria and the help of Carthage in his Grecian wars. The war which followed (214-205) is known as the First Macedonian War; at no time in the course of it did Philip render Hannibal any effective aid, and for the first three years the war was conducted on both sides with lack of energy. In 214 the Roman general, M. Valerius Lævinus, compelled Philip to raise the siege of Apollonia, and in 211 Rome organized against Macedon a coalition of Greek States with the Ætolian League at the head. Peace was concluded in 205 without material gain on either side. In 204 Philip made a bargain with Antiochus III. to divide between them certain of the dominions of the youthful King of Egypt, Ptolemy Epiphanes. This interference of Philip in the East precipitated the Second Macedonian War with Rome, which began in 200 and was brought to a close by the battle of Cynoscephalæ in 197. In this battle the Macedonian army was utterly defeated by Titus Quintius Flamininus; Philip was compelled to relinquish his conquests in Europe and Asia, to surrender his fleet, and to pay an indemnity of a thousand talents; Macedonia became an ally, subject to the control of Rome. Philip died in 179, and was succeeded by his son Perseus. Consult: Droysen, *Geschichte des Hellenismus* (2d ed., Gotha, 1877-78); Freeman, *History of Federal Government* (2d ed., New York, 1893); Mahaffy, *Alexander's Empire* (New York, 1888).

PHILIP I. (c.1052-1108). King of France from 1060 to 1108. He was the eldest son of King Henry I. and Anne of Russia. Until 1066, when Philip came of age, his mother and his uncle, Baldwin V. of Flanders, were regents. In the various contests of his great feudatories, to whom belonged William I. of England as Duke of Normandy, Philip often intervened successfully, so that the royal domain was increased until it extended from the valley of the Seine to the valley of the Loire, and also included Bourges. About 1071 Philip married Bertha, step-daughter of Count Robert of Holland. Though a son was born to them in 1081 (later Louis VI.), and afterwards a daughter, Philip nevertheless repudiated his wife in 1092, and began to live with Bertrada, the wife of Count Fulk of Anjou. The result was a continuous strife between the Papacy and the King. In 1095, at the Council of Clermont, Urban II. excommunicated Philip, though Bertha had died in 1094. This excommunication was raised after Philip had promised to put Bertrada away, but renewed in 1097, when he relapsed. In 1105, after Bertrada had died, he was released from the ban. Consult Luchaire, *Louis VI. le Gros* (Paris, 1890).

PHILIP II., or PHILIP AUGUSTUS (1165-1223). King of France from 1180 to 1223. He was the son of Louis VII. and Adèle of Champagne, and was born on August 21, 1165. He was crowned on November 1, 1179, during the life of his father, succeeded him in 1108, and proved one of the greatest monarchs of the Capetian dynasty. In 1181 he made war upon the Count of Flanders and in 1185 forced him to surrender the districts of Vermandois and Amiénois. In 1182 he drove the Jews out of his territories and confiscated all their wealth. In 1187 the English attempt to conquer Languedoc caused a war, in which Philip was aided by the sons of Henry II. (q.v.). After the accession (1189) of Richard to the English throne, Philip and he set out together on the Third Crusade (1190), but quarreled while wintering in Sicily, and their dissensions continuing, Philip, after a sojourn of three and a half months in Syria, set out on his return to France, after taking a solemn oath to respect the integrity of Richard's dominions. No sooner, however, had he returned than he entered into an arrangement for the partition of Richard's territories in France with his unworthy brother, John. Some acquisitions were made, but Richard's return thwarted the calculations of the conspirators, and a war immediately commenced between the two monarchs, in which Philip had at one and the same time to defend his territories against the English and the counts of Champagne, Boulogne, Brittany, and Hainault, who attacked them on all sides. Richard died in 1199; but on the appeal of the Barons of Poitou to Philip, as John's overlord, the war soon recommenced against John (q.v.). The English provinces in France were attacked by the combined French and Bretons, and Normandy, Poitou, Maine, Anjou, and Touraine were annexed to France. In the years 1213 and 1214 Philip waged war against Flanders and thus caused a coalition to be formed by Otho IV. (q.v.) of Germany, John of England, and the Count of Flanders. Philip defeated the allies in 1214 at Bouvines (q.v.). During the rest of his reign Philip was occupied in consolidating his new possessions, and took no part in the war against the Albigenses. In general Philip was in alliance with the Church and the great cities. His first wife was Isabella of Hainault, the mother of Louis VIII.; he next married Ingeborg of Denmark, but repudiated her in 1196 to marry Agnes of Meran. For this he was excommunicated and France was placed under an interdict. Philip yielded in 1200 and took back Ingeborg. He improved and embellished Paris, built many churches and other institutions, encouraged commercial associations, and gave the first charter to the University of Paris. He fortified many of the chief towns, including the capital. He died at Mantes, July 14, 1223. Philip was the first monarch under whom France attained a commanding position in Europe. Consult: Cartellieri, *Philip II., August* (Leipzig, 1899); Luchaire, *Philippe Auguste* (Paris, 1881).

PHILIP III., LE HARDI, i.e., the Bold (1245-85). King of France from 1270 to 1285. He was the son of Louis IX., and had his father's piety, but not his ability. He was an unimportant man personally, but his reign is noted on account of the rise of the lawyers as a class of royal advisers. Consult Langlois, *Le règne de Philippe III. le Hardi* (Paris, 1887).

PHILIP IV., THE FAIR (1268-1314). King of France from 1285 to 1314. He succeeded his father, Philip III. During his reign, which was of exceeding importance for the development of the French monarchy, he had three prominent advisers, Pierre Flotte, William of Nogaret, and Enguerrand of Marigny, who, being all taken from the rising legal class, were known as *légistes*. The event which stands out most prominently in this reign was the conflict with the Papacy under Boniface VIII. (q.v.). The French government sought to tax the clergy, whereupon Boniface interfered and issued the bull *Clericis laicos* in 1296, ordering the clergy to refuse obedience to the King. Boniface, it is true, gave way at once when a decree was issued forbidding the exportation of metals from France, the effect of which would have been to cut off a large portion of the Papal revenue, but the success of the Jubilee at Rome in 1300 induced Boniface to believe that he would find sufficient support in a struggle with Philip IV., and hence when in 1301 Bernard Saisset, Bishop of Pamiers, a Papal representative in France, was arrested there, Boniface issued his famous bull *Unam sanctam*. This set forth the highest Papal pretensions, and was a challenge to all monarchs of Europe. Philip, in order to be certain of support, summoned for the first time in the history of France the States-General. In 1303 while Boniface was at Anagni he was suddenly captured by William of Nogaret, and, though released the following day, he died soon after as a result of the shock. After the short rule of Benedict XI., Philip obtained in 1305 the election of his adherent, the Archbishop of Bordeaux, to the Papal chair, as Clement V. In 1309 the Pope took up his residence at Avignon, and until 1378 the Papacy was entirely under French influence, this being the period of the so-called Babylonish Captivity. See PAPACY.

On account of the increased expenditures of the monarchy, due to its greater extension and enlarged duties, it was found more and more difficult to carry on the government with the old revenues alone. A temporary expedient was found by compelling Clement V. to condemn the wealthy Templars and deliver their property over to the French King. Philip early in his reign had difficulties with Edward I. of England. In 1294 he took possession of Guienne, Edward's territory, and in 1297 attacked Guy, Count of Flanders, who had supported the English monarch. Boniface VIII. brought about a truce in 1298, and Guienne was restored to Edward. When, however, Guy of Flanders appeared in Paris in 1300 to submit, Philip cast him into prison. His officials treated the wealthy Flemish cities so harshly that they revolted under Peter of Koninck. Philip's army was decisively defeated at Courtrai (q.v.) in 1302, and in 1305 he made peace, restoring Flanders to the son of Count Guy, the latter having died in prison.

Scholars have long disputed concerning the true character of Philip. On the one hand he has been represented as an avaricious, scheming monarch; on the other as a mild man, who was completely in the hands of bold counselors. But concerning the results of his reign there is no question. Feudalism was suppressed, and the power of the Crown vastly extended. In order to meet the financial needs of the State, the taxes were increased, the Jews persecuted, and their property confiscated; and when these means were insufficient, the coinage was debased. Consult: Boutaric, *La France sous Philippe le Bel* (Paris, 1861); Funck-Brentano, *Philippe le Bel et la Flandre* (ib. 1896); Jully, *Philippe le Bel* (ib., 1869).

PHILIP V., LE LONG, i.e. the Tall (c.1294-1322). King of France from 1316 to 1322. He was the second son of Philip IV., and on the death of his brother, Louis X., was made Regent, as the Queen was with child. Her son died four days after birth and Philip proclaimed himself King (1316). Many opposed him, supporting the claims of his niece, the daughter of Louis X. The States-General, summoned by Philip in 1317, declared that women could not succeed to the throne. (See SALIC LAW.) In the same year Philip settled the long dispute with Flanders and acquired some territory from its Count. In 1320 a large number of peasants, known as Pastoureaux, led by some renegade clerks, demanded to be taken on a crusade. They committed horrible outrages, but were finally suppressed. Philip's reign is noteworthy for its many administrative reforms. He centralized the treasury receipts at Paris, suppressed the garrisons in castles not on the frontiers, confiscated for the Crown many feudal rights of taxation enjoyed by the nobles, and organized the army more efficiently. In other attempted reforms he was thwarted by opposition from the States-General. Consult Lechugeur, *Histoire de Philippe V. le Long* (Paris, 1897).

PHILIP VI. (1293-1350). King of France from 1328 to 1350, the first King of the House of Valois. He was the son of Charles of Valois, younger brother of Philip IV. At first Regent of France on the death of Charles IV., the proclamation of a king being deferred on account of the pregnancy of Charles IV.'s widow, he was crowned at Rheims on May 29, 1328, after the Queen had given birth to a girl. His right to the throne was denied by Edward III. of England, the grandson of Philip IV., who declared that females, though excluded by the Salic law, could transmit their rights to their children, and, therefore, insisted upon the superiority of his own claims. Philip's reign commenced gloriously, for, marching into Flanders to support the Count against his rebellious subjects, he wiped out the disgrace of Courtrai by vanquishing the Flemings at Cassel, August 23, 1328. The relations with England were very strained, and in 1337 the Hundred Years' War (q.v.) began, mainly through Philip's own fault. It was carried on languidly for several years, the only prominent incident being the destruction of the French fleet off Sluis, June 24, 1340. Philip was very extravagant and delighted in maintaining a brilliant court. The constant round of fêtes and tournaments was never interrupted, even when the war had well nigh exhausted the wealth of the country, for the money to carry them on was immediately provided by some new tax, by an arbitrary change in the coinage, or by some fresh confiscation. In 1338 the States-General declared that their consent was necessary for the imposition of new taxes, but Philip evaded all restraints which were imposed. In 1346 Edward III. landed in Normandy, ravaged the country to the environs of Paris, and totally defeated Philip at Crécy (q.v.). A truce was

then concluded by Papal mediation in 1347, but the kingdom had no sooner been released from war than destruction in another and more terrible form, that of the 'black death' (q.v.), appeared. Nevertheless the extravagance at the Court was as great as ever. During Philip's reign the royal domain was increased by the addition of Valois, Chartres, Anjou, Maine, Champagne, Brie, and Dauphiné, but diminished by the exchange of Navarre for Champagne and Brie. Consult Lavisse and Rambaud, *Histoire générale*, vol. iii. (Paris, 1894), for a good general sketch and bibliography. See FRANCE.

PHILIP II. (1527-98). King of Spain from 1556 to 1598. He was born at Valladolid on May 21, 1527, the only son of the Emperor Charles V. (q.v.). His education was chiefly in the hands of the clergy and he grew up a cold and bigoted man. In 1543 he was married to Maria of Portugal, and upon her death he espoused in 1554 Mary I. of England (q.v.). In 1555 Charles V. surrendered the government of the Netherlands to Philip, and in the following year resigned also the crown of Spain to his son, who had been previously invested with the sovereignty of Naples, Sicily, and Milan. The possession of Spain in the New World included the West Indies, Mexico, and a great part of South America. The early part of the reign of Philip proved very successful. He defeated a coalition formed against him by the Pope and France, his armies winning several battles, notably that of Saint-Quentin (1557), and France was compelled to sign on April 2-3, 1559, the Treaty of Cateau-Cambrésis (q.v.), which marked the abandonment of her rôle as an aggressive power on the side of Italy. Philip determined to stamp out opposition to Roman Catholicism in all his dominions, and this caused the revolt of the Netherlands (q.v.). This successful rebellion, and the enormous expenses it entailed upon Spain, ruined the prosperity of Philip's dominions. The naval supremacy of Spain, moreover, was shattered by the defeat of the Armada (q.v.), which Philip had sent against England in 1588. Besides the war against England, Philip was led by the affairs in the Netherlands to interfere also in the concerns of France. He has been sometimes accused of having instigated the Massacre of Saint Bartholomew, and he supported the Guises against Henry of Navarre (later Henry IV.), but all in vain. On May 2, 1598, the Treaty of Vervins (q.v.) was concluded with France. Against the Turks Philip was more successful. They were decisively defeated in 1571 by his half-brother, John of Austria, commanding the fleet of the Holy League (Spain, Venice, the Papal States), at Lepanto (q.v.). Portugal was conquered by Philip's general, the Duke of Alva (q.v.), after the direct male line of that country had become extinct in 1580. But these successes were unable to outweigh the ruin of Spanish commerce and industry. Philip died after a lingering illness on September 13, 1598. After the death of Mary of England in 1558, Philip married in 1559 Elizabeth, the daughter of Henry II. of France, and when she died in 1568, he married Anna, a daughter of the Emperor Maximilian II. By his first wife Philip had a son, the celebrated Don Carlos (q.v.), and by his fourth wife, his successor, Philip III. (q.v.). Philip II.'s character has been the subject of considerable historical controversy. There can be little doubt that he was bigoted and morose, but, on the other hand, the popular view, which represents him as a cruel monster, is a false one. He seems to have been an idealist and a visionary, who believed firmly that he was benefiting humanity by his drastic measures. He was often open to appeals for mercy and leniency, but the Inquisition was permitted a free sway in Spain, and all liberty was crushed.

Consult: Prescott, *History of the Reign of Philip II., King of Spain* (Boston, 1855-56), which is valuable, but incomplete; Forneron, *Histoire de Philippe II.* (Paris, 1881-82); Philippson, *Westeuropa im Zeitalter von Philipp II., Elisabeth und Heinrich IV.* (Berlin, 1882); Mignet, *Antonio Perez et Philippe II.* (Paris, 1874); Lobkowitz, *Philippus Prudens* (Antwerp, 1639); Gachard, *Correspondance de Philippe II. sur les affaires des Pays-Bas* (5 vols., Brussels, 1848-79); id., *Lettres de Philippe II. à ses filles les Infantes Isabelle et Catherine* (Paris, 1884); id., *Correspondencia de Felipe II. con sus embajadores en la corte de Inglaterra, 1558-8* (4 vols., Madrid, 1888). See SPAIN.

PHILIP III. (1578-1621). King of Spain from 1598 to 1621. He was the son of Philip II. and is to be remembered chiefly for accelerating the ruin of Spain, which had begun under his father, by driving out in 1609 the Moriscos (q.v.), the most industrious and thrifty inhabitants of Spain.

PHILIP IV. (1605-65). King of Spain from 1621 to 1665. He took little part in the affairs of government, which from 1623 to 1643 were in the hands of his favorite Olivarez (q.v.). In spite of the latter's efforts for the encouragement of trade and industry, the decline of Spain was hastened by exhausting wars in Germany and with France. In 1640 Portugal conquered its independence, and by the Treaty of Westphalia Spain acknowledged the independence of the Netherlands. The Peace of the Pyrenees in 1659 was highly favorable to France. Philip's reign was disturbed also by insurrections in Catalonia and Andalusia.

PHILIP V. (1683-1746). King of Spain from 1700 to 1746, first of the Spanish Bourbon dynasty. He was directly descended on both sides from Philip II., and was born at Versailles, December 19, 1683, the son of the Dauphin Louis and Maria Anna of Bavaria, and grandson of Louis XIV. and Maria Theresa, eldest sister of Charles II. of Spain. The Archduke Charles of Austria, second son of the Emperor Leopold I., stood equally near the Spanish succession; but Charles II., dying without issue, left the kingdom by his last will to Philip, then Duke of Anjou (1700). Philip was at once proclaimed at Fontainebleau and at Madrid as Philip V. To defend this succession, which threatened to disturb the religious political balance in Europe, France and Spain became involved in war with the Grand Alliance, formed by England, Holland, and Austria, and joined by Prussia, Denmark, Hanover, Portugal, and finally Savoy. (See SUCCESSION WARS.) The Peace of Utrecht (April 11, 1713) secured the throne of Spain to Philip, but shorn of the Italian possessions and the Netherlands. Philip V. was distinguished 'for few faults and few virtues,' was weak minded, and became almost imbecile before his death. His first wife, Marie Louise of Savoy, died in

1714, and with her death ended the influence the Countess Orsini had acquired over him, for Philip married Elizabeth Farnese of Parma, an energetic and ambitious woman. Her schemes for advancing the interests of her sons kept Spain embroiled throughout the reign. The minister Cardinal Alberoni (q.v.) directed his policy toward regaining the lost Spanish possessions in Italy and had to be removed because of the hostility aroused among the powers. In 1724 Philip abdicated in favor of his eldest son, Louis, but upon the death of the latter in the same year he resumed the crown, notwithstanding his increasing incapacity. In 1734-35 Don Carlos, son of Philip, wrested the Two Sicilies from Austria. In 1741 Spain entered into an alliance with France against Maria Theresa in the War of the Austrian Succession. (See SUCCESSION WARS.) Philip died at Madrid on July 9, 1746. He was succeeded by his second son, Ferdinand VI. (q.v.). Consult: Coxe, *Memoirs of the Kings of Spain of the House of Bourbon from the Accession of Philip V. to the Death of Charles III.* (5 vols., London, 1815), a work that is still of value, although new sources have come to light since it was written; Boudeillart, *Philippe V. et la cour de France, 1700-15* (Paris, 1890). See SPAIN.

PHILIP OF SWABIA (c.1177-1208). An emperor of the Holy Roman Empire. He was the youngest son of Frederick Barbarossa and Beatrice of Burgundy. He was educated for the Church and in 1191 became Bishop of Würzburg. In 1192 he resigned his see. His brother, the Emperor Henry VI., gave him Tuscany in 1195 and in 1196 he succeeded to the Duchy of Swabia. In 1197 he married the Byzantine Princess Irene. On the death of Henry VI., in 1197, Philip endeavored to secure the Imperial crown for his brother's infant son, Frederick (II.), but the German princes were unwilling to place the child on the throne, and Philip himself was chosen Emperor in 1198. But the Guelphs, under the leadership of Adolf, Archbishop of Cologne, put forward as a candidate Otho of Brunswick, who was crowned two months before Philip (1198), and in 1201 gained the support of Pope Innocent III. Philip fought bravely against great odds, and by bribes won over the Archbishop of Cologne and Hermann of Thuringia, with other powerful princes. In 1205 he was crowned by the Archbishop of Cologne, and captured the city, but let his rival slip through his fingers (1206). He made terms with Otho and with Innocent III. The former broke his promises, and Philip, making ready to attack him, was assassinated by Otho of Wittelsbach. Consult Winkelmann, *Philipp von Schwaben und Otto IV. von Braunschweig* (Leipzig, 1873-78).

PHILIP THE BOLD (1342-1404). Duke of Burgundy from 1363 to 1404. He was the fourth son of John the Good, King of France. He was present in 1356 at the battle of Poitiers (q.v.), and displayed such courage, venturing his own life to save that of his father, that he became known as *Le Hardi*, i.e. 'the Bold.' He shared his father's captivity in England, and on returning to France in 1360 received in reward of his bravery the Duchy of Touraine, and subsequently (1363) also that of Burgundy, being created at the same time the first peer of France. In 1369 he married Margaret, the daughter and heiress of Count Louis de Mâle of Flanders. On the death of King Charles V., in 1380, he became Regent, together with his brothers, for his nephew, Charles VI. In 1382, at the head of a French army, he marched against Philip van Artevelde, the leader of the Flemish burghers in their revolt against their Count, and overwhelmed him in the battle of Roosebeke. Flanders, Artois, and Franche-Comté fell to him by the death of Louis in 1384. Energy and wisdom characterized his government; arts, manufactures, and commerce were encouraged, and his land was one of the best governed in Europe. When Charles VI. became insane (1392) the supreme control of affairs in France fell into the hands of Philip, and he used his power to strengthen his own line. He died at the château of Hall in Hainault, April 27, 1404. Consult Lavisse and Rambaud, *Histoire générale*, vol. iii. (Paris, 1894), and bibliography. See also FRANCE.

PHILIP THE GOOD (1396-1467). Duke of Burgundy from 1419 to 1467. He was the son of John the Fearless and Margaret of Bavaria. He was born at Dijon, June 13, 1396, and on the assassination of his father on the bridge of Montereau, succeeded to the Duchy of Burgundy. Bent on avenging the murder of his father, he entered into an offensive and defensive alliance with Henry V. of England at Arras in 1419, recognizing him as the rightful Regent of France, and heir to the throne after Charles VI.'s death. This agreement was sanctioned by the imbecile King himself as well as by the mother of the Dauphin, Queen Isabella, in the Treaty of Troyes (1420). The Dauphin (later Charles VII.), however, declined to resign his rights, and took to arms, but was defeated and driven beyond the Loire. Some disputes with the English concerning possessions in Brabant and elsewhere prompted Philip to threaten in 1429 to conclude a treaty with Charles VII. However, the English, by ceding to Philip the Province of Champagne, and paying him a large sum of money, restored him to their side. In 1429-30 Namur, Brabant, and Limburg were annexed to Burgundy, and in 1433 Countess Jacqueline ceded Hainault, Holland, and Zealand to Philip. Though much more powerful than his nominal superior, the King of France, Philip did not take the royal title. After the death of his wife, sister of the English Regent in France, the Duke of Bedford, he gradually drew nearer to Charles VII., and in 1435 tried to negotiate a peace at Arras between all parties in the Hundred Years' War. The English demands proving excessive, he made peace alone with the French King. The latter part of his reign was filled with trouble caused by the quarrels between Charles VII. and his son, the Dauphin Louis, afterwards Louis XI. (q.v.), who had fled from his father's Court, and sought shelter with Philip. Philip died at Bruges, July 15, 1467, deeply lamented by his subjects. Under him, Burgundy was the most wealthy, prosperous, and tranquil State in Europe; its ruler was the most feared and admired sovereign of his time, and his Court far surpassed in brilliancy those of his contemporaries. Knights and nobles from all parts of Europe flocked to his jousts and tournaments. In 1430, in honor of his marriage with Isabella of Portugal, his third wife, he established the famous order of the Golden Fleece (q.v.). De Barante, *Histoire des ducs de Bourgogne*, vols.

iii.-vi. (2d ed., Brussels, 1834-40). See CHARLES VII.

PHILIP THE MAGNANIMOUS (1504-67). Landgrave of Hesse from 1509 to 1567. He was born on November 13, 1504, and succeeded to the throne on the death of his father, William II. In 1518 he began to govern in person. At first he showed no sympathy for the Lutheran doctrines, of which he was to become the champion, and in 1523 he married the daughter of the Catholic Duke George of Saxony. In 1525, however, he was definitely won over to the cause of the Reformation. At the same time he aided in supressing the Peasants' War. Philip became one of the chief leaders of the Reformation in Germany, and together with the Elector John of Saxony formed in 1526 the Protestant League of Gotha and Torgau. In 1529 he arranged the celebrated disputation between Luther and Zwingli at Marburg. It lasted for three days (October 1st-3d), but the two parties were unable to agree on the doctrine of the Eucharist. Philip himself, however, began to lean strongly toward the Swiss side. In 1531 he formed together with the Elector of Saxony and other Protestant princes the League of Schmalkald (q.v.). On March 4, 1540, Philip married a second time, though his first wife was still living. Luther and Melanchthon had consented to this bigamy, and the revelation of this fact caused a great scandal. In the Schmalkald War, which broke out in 1546, Philip did his best for the Protestant cause, but the treachery of Maurice of Saxony, his son-in-law, who joined Charles V., made matters hopeless. At the battle of Mühlberg on April 24, 1547, Philip was made prisoner and placed in close confinement. He was liberated in 1552 by the action of Maurice, who deserted Charles and rejoined the Protestant cause. Philip died on March 31, 1567, leaving four sons, among whom Hesse was divided. Consult: Rommel, *Philipp der Grossmütige, Landgraf von Hessen* (Giessen, 1830); Ranke, *History of the Reformation in Germany* (Eng. trans., London, 1845-47); Janssen, *History of the German People at the Close of the Middle Ages* (Eng. trans., ib., 1896—).

PHILIP THE MAGNANIMOUS, ORDER OF. A Hessian order of merit with five classes, founded by Grand Duke Ludwig II. in 1840. The decoration is an eight-pointed cross of white enamel, with the motto *Si Deus nobiscum, quis contra nos.*

PHILIP, KING (?-1676). A famous Indian chief, son of Massasoit; called by the English King Philip, though his Indian name was Metacomet. He became sachem of the Wampanoags, who were settled in the Rhode Island country in 1662, and in the same year went to Plymouth and promised to maintain friendly relations with the English colonists and not to cede any territory without their knowledge. About 1670 his friendly intentions began to be suspected on account of frequent meetings of the tribes and many murders of white settlers. In view of these suspicions, Philip and the principal tribesmen were summoned to meet the whites and explain their movements. This they did, and also agreed to surrender their arms; but it was only a truce, and preparations for war were still secretly carried on by the Indians. An Indian convert named Sausamon revealed to the colonists the preparations made by Philip, and was murdered by the Indians. In revenge for the execution of his murderers by the whites, the Indians killed eight or nine colonists, and open hostilities were begun in June, 1675. The Indians did not venture to meet the colonists in battle, but burned or attacked a number of their settlements, including Swansea, Brookfield, Deerfield, and Hadley, and laid ambuscades for the settlers. In December, 1675, Governor Josiah Winslow led a force of 1000 men against the Narragansets, with whom Philip had formed an alliance, took by storm a fort said to have contained 4000 Indians, near the present location of Kingston, R. I., destroyed their village of 500 wigwams, and put to death 500 of their warriors and twice as many Indian women and children. The war went on for the first six months of 1676, and was marked by burnings and massacres at Weymouth, Groton, Medfield, and Lancaster, Mass., and at Warwick and Providence, R. I. But the increased efforts of the colonists soon struck demoralization into the ranks of the Indians. A substantial reward was offered by the Government for every Indian killed in battle, and many Indian women and children were captured and sold into slavery. A force under the command of the great Indian fighter Capt. Benjamin Church (q.v.) hunted Philip from place to place, at last locating him through the aid of a friendly Indian in a swamp near Mount Hope, where he was killed by another Indian while trying to escape. His body was quartered, on a Thanksgiving Day especially appointed, and his head was sent to Plymouth, where it was long kept on a gibbet. During this war some 600 colonists were killed, 600 buildings burned, and 13 towns destroyed, but of the two once powerful Indian tribes it is said that less than 200 individuals were left. The cost of the war was estimated at $1,000,000. Consult: Fiske, *The Beginnings of New England* (Boston, 1889); Palfrey, *History of New England* (ib., 1864); and Doyle, *The English Colonies in America*, vol. iii. (New York, 1889).

PHILIP, GOSPEL OF. See APOCRYPHA, section on *New Testament.*

PHILIP, THE ADVENTURES OF. A novel by Thackeray (1862). This sequel to *The Shabby Genteel Story* appeared in the *Cornhill Magazine* (1861-62). Philip Firmin, the attractive, high-spirited hero, was almost ruined by his unspeakable father, the doctor, ignored by his relatives, helped by the Pendennises, and happily married to Charlotte Bayne.

PHILIP, JOHN WOODWARD (1840-1900). An American naval officer, born in New York City. He was appointed to the United States Naval Academy at the age of sixteen, became midshipman in 1861, and during the Civil War served in the Gulf blockading squadron, the James River fleet, and the South Atlantic blockading squadron, acting as executive of the *Chippewa*, *Pawnee*, and *Montauk* at the siege of Charleston. In July, 1862, he was promoted to be lieutenant, and in July, 1866, to be lieutenant commander. After the war he was executive successively of the *Hartford* and the *Richmond*, was placed in command of the *Monocacy* in June, 1873, and in December, 1874, was commissioned commander. From 1874 to 1876, on leave of absence, he commanded one of the steamers of the Pacific Mail Steamship Company, running between San Fran-

ense and Hong Kong, and in 1877, again on a leave of absence, he commanded the 'Woodruff Scientific Expedition Around the World.' He was promoted to be captain in 1889, commanded the Boston Navy Yard from 1894 to 1897, and in the latter year was placed in command of the battleship *Texas*, which, still under his command, took a prominent part in the naval battle of Santiago during the Spanish-American War. In August, 1898, he was promoted to be commodore and was placed in command of the second squadron of the North Atlantic fleet, and in March, 1899, he was promoted to be rear-admiral and made commandant of the Brooklyn Navy Yard.

PHILIP NE'RI, Saint (1515-95). The founder of the Congregation of the Oratory (q.v.). He was born at Florence of a distinguished family, July 21, 1515. On the death of his parents in 1533, he was adopted as his heir by a wealthy relative, with whom he lived for a time at San Germano, near Monte Cassino. But he relinquished these prospects to devote himself to the service of God, and on the advice of the Benedictine monks of Monte Cassino, came to Rome to make his theological and philosophical studies (1534-37). He devoted himself to works of mercy, once sold his books to feed the poor, and in 1548, in conjunction with his confessor, Persiano Rosa, founded the Confraternity of the Holy Trinity to care for the needs of the vast numbers of pilgrims who came to Rome. This brotherhood is said to have provided hospitality for not less than 600,000 pilgrims in the jubilee year of 1625, and for a quarter of a million in 1825. (See Morichini, *Instituti di pubblica carità*, Rome, 1870.) Having long refused holy orders from motives of humility, he finally received them in 1551, and began as a priest a still more remarkable career of devotion and influence. Inspired by the tidings of the heroic labors and death of Saint Francis Xavier, he determined to go to the Indies, and assembled 20 companions; but he was finally convinced that Rome was meant to be the field of his work. The objects of the informal association out of which the Congregation of the Oratory later developed were the instruction and training of the young and uneducated. As a means of withdrawing them from dangerous amusements, sacred musical entertainments (hence called by the name of *oratorio*) were held in the oratory, at first consisting merely of hymns set to popular tunes, but afterwards partaking more of the nature of sacred dramas. The music was composed by the first musicians of Rome. Palestrina was a spiritual child of Philip's, and died in his arms. It was in the lectures originally prepared for use in the oratory that, at Saint Philip's instance, the gigantic Church History of Baronius had its beginning. The personal character of Philip, the unselfish devotion of his life, his unaffected piety, genuine love of the poor, kindly and cheerful disposition, and perhaps as much as anything else a certain quaint humor which pervaded many of his sayings and doings, contributed to popularize his work. The development of the Oratory was almost unconscious. In 1561 Philip was requested by his fellow-countrymen the Florentines in Rome to take charge of their Church of San Giovanni near the Ponte Sant' Angelo; he declined, until Pope Pius IV. gave him permission to hold it while still retaining his residence in his humble cell at San Girolamo. In 1574 the Florentines erected a new oratory near the church, and the exercises were held there for a time; the following year he saw himself compelled to provide for the permanence of his work on a larger scale, and, taking the small Church of Santa Maria in Vallicella, he pulled it down and built a large new one. Here he was authorized by Gregory XIII. to found a definitely organized congregation in the same year. He still remained at San Girolamo, and refused to appear as the head and founder of the new society, until in 1583 he was expressly commanded by the Pope to take up his residence in the new house. Then his associates elected him superior for life, despite all his protests. Ten years later, however, he prevailed upon them to let him lay the burden aside, and Baronius was chosen in his stead. He died May 26, 1595. Paul V. beatified him in 1615 and Gregory XV. canonized him in 1622. Called the Apostle of Rome, he remains to this day emphatically the popular saint of the Roman people, who observe his feast-day with great devotion. From 1726 until the Italian occupation, the popes were accustomed to go in solemn state on this day to visit his tomb and to say mass there. Consult the contemporary lives of Gallonio, Barnabei, and Bacci (the two first contained in the *Acta Sanctorum*); English translation of the last by F. W. Faber (London, 1847); a modern biography by Cardinal Capecelatro (Naples, 1879; Eng. trans., London, 1894); *Maxims and Counsels of Saint Philip Neri* (Dublin, 1890); Cardinal Wiseman, *Panegyric of Saint Philip Neri* (London, 1856).

PHILIPP, Isidor (1863—). A French pianist of Austrian birth. He was born at Pesth, but early removed to France. In 1879 he entered the Conservatory as a pupil of Mathias, and later studied under other famous teachers of that institution. He was intimately connected with the musical life of Paris, and did much to spread a love for classical chamber music. He was one of the most popular artists appearing at the Lamoreux concerts, and was equally well received throughout the large cities of France. In London and Brussels he was also highly esteemed. His published compositions have been successful, particularly his editions of classic studies. Together with Loeb and Berthelier, he organized a series of concerts given in the Salle Erard, which concerts were largely devoted to the presentation of new French compositions. He was also cofounder and subsequent president of the Société d'Art.

PHILIPPA OF HAINAULT, hā'nō' (c.1314-69). An English queen, wife of Edward III. and daughter of William the Good, of Holland and Hainault. She was married in 1328 to her cousin, Edward of England, by Papal dispensation, and brought him a large dower and valuable Continental allies during the war with France. It is said that she summoned the forces which defeated the Scottish troops at Neville's Cross (q.v.) in 1346. Philippa was mother of the Black Prince, Edward. She was a patron of Froissart and was very popular among the English common people. Queen Philippa is notable because she aided in maintaining and strengthening that close connection of England and Flanders, so important for English commerce.

PHILIPPE DE THAUN. See Thaun.

PHILIPPEVILLE, fē'lēp'vēl'. A fortified seaport and the capital of an arrondissement in the Department of Constantine, Algeria, 38 miles north-northeast of the city of Constantine, on the Gulf of Stora, between Cape Bonjaroun and Cape de Fer (Map: Africa, E 1). Laid out in 1838 by Marshal Valée, on the ruins of the ancient Russicada, it is one of the prettiest towns in Algeria, and thoroughly French in its character. Philippeville is the chief railway station for the Department of Constantine, and is connected by steamer with Marseilles and Algiers. It has several public offices, a large hospital and dispensary, Catholic and Protestant churches, public library and museum, theatre, etc. It has a distillery, tanneries, and cork manufactures. In the vicinity at Filfila are quarries of marble and iron mines. The town is an important entrepôt of the commerce of the east of Algeria and the Sahara, and the country in the vicinity is picturesque and fertile, producing grain, tobacco, cotton, and fruits. Its fine outer and inner harbors of 125 acres are protected by two breakwaters. The total annual value of its imports and exports is $17,500,000. Population, in 1901, 21,251.

PHIL'IPP GALEN, gā'len. See LANGE, ERNST P. K.

PHILIP'PI (Lat., from Gk. Φίλιπποι). A city of Macedonia. It was named after Philip II. of Macedon, who conquered it from Thrace, up to which time it had been called Crenides, or 'the place of fountains,' and enlarged it because of the gold mines in its neighborhood. It was situated on a high hill on the southern edge of a great plain, and about nine miles from the coast, where was the harbor Neapolis. With the rest of Macedonia it fell under the Roman power in B.C. 168, and was joined to the District of Amphipolis. In B.C. 42 it was the scene of the battles between Brutus and Cassius on the one side and Mark Antony and Octavian on the other, which resulted in the destruction of the former. In consequence of this victory, Augustus subsequently made it a Roman colony and conferred on its inhabitants the *jus Italicum*, which exempted them also from the land tax. Here about A.D. 50 the Apostle Paul founded a Christian church, to which is addressed the Epistle to the Philippians. An epistle to the same church is also preserved among the writings of Polycarp. The ruins are still called in Turkish Felib-edjik.

PHILIPPI, FELIX (1851—). A German dramatist, born in Berlin. He early entered journalism, and in 1875 removed to Munich, where he contributed to various French and German papers. After about 1884, however, he devoted himself almost wholly to the writing of plays, and ultimately became one of the most popular contemporary dramatists in Germany, his plays being produced also in other countries and being given with considerable success in the German theatres in New York City. As a playwright he is classed with the modern realistic school. His plays include: *Der Withrakat* (1884); *Irrlicht* (1885); *Dagmar* (1886); *Meerschlechten* (1888); *Das alte Lied* (1889); *Die Rhein Fran* (1891); *Der verlorene Sohn* (1892); *Wohlthäter der Menschheit* (1895); *Der Dornenweg* (1895); and *Wer Wars?* (1896).

PHILIPPIANS, EPISTLE TO THE. One of the New Testament letters, whose authorship is generally assigned to Paul. It was written to the church at Philippi to correct tendencies toward faction and self-seeking among its members (ii. 1-4, 14; iv. 2-5), to warn them against evil influences in their midst (iii.), to encourage and strengthen them in their Christian life and work (i. 12-30; ii. 12-16; iv. 1, 4, 6, 8), and to thank them for their practical ministry to the Apostle's needs in his imprisonment (iv. 10-19). It differs from the principal Pauline Epistles in the marked absence from its contents of controversial topics, while, on the other hand, it is unlike most of the subordinate writings of the Apostle in containing passages which have formed the gathering points of considerable theological debate. These are chiefly the notable Christological passage of the second chapter (vs. 5-11) and, though to a much less degree, the well-known soteriological passage of the third chapter (vs. 3-16).

In spite of the denial of the Epistle's Pauline origin by the Tübingen school (1845) and by as recent and able a scholar as Holsten (1898), the letter is to-day almost universally accepted as from the Apostle—its rejection by the modern Dutch school of criticism (1882) merely forming a part of their peculiar negative position with regard to all the New Testament books. A phase of this Dutch critical attack, however, is the denial of the Epistle's integrity, in which position certain outside the school have joined (Spitta, 1893; Clemen, 1894). But, though there are recognized difficulties in its sequence of thought, especially in the connection of the third chapter with its preceding and following context, the letter's unity is generally maintained by critics to-day. Scholars have almost without exception settled upon Rome, during Paul's first imprisonment, as the place and time of the Epistle's composition. Thiersch (1879) and Macpherson (1892) being practically alone among later writers in the assertion of an origin at Cæsarea before Paul's voyage to Rome.

That which may be said to be of chief interest in the criticism of the Book is the question of its relative order to the other Epistles of Paul's first Roman imprisonment. The opinion more generally in favor to-day is that it is the last of this captivity group. It is argued that (a) the large size of the Church of Rome (i. 12-14); (b) the evidence of success from Paul's evangelistic work (i. 12-18), which would follow the statements made in Colossians and Ephesians of desire for such success (Col. iv. 3-4; Eph. vi. 19-20); (c) the several journeys between Philippi and Rome involved in the Philippians' ministry to the Apostle (ii. 25-27; iv. 18); (d) the desertion of the Apostle by his friends (ii. 19-21), which shows itself to be the climax of Col. iv. 11 and at the same time stands in contrast to Col. iv. 10-14 and Philemon 23-24; (e) the expectation of the near approach of his trial and the decision for life or death (i. 20-22; ii. 17, 24-26; iii. 10)—that these all show more naturally a later rather than an earlier date of writing. On the other hand, it is held that the similarity of much of the contents of the Epistle to the characteristic thought of Romans, and of much of the contents of Colossians and Ephesians with that which marks the thought of the pastorals, show in both cases a state of mind on the Apostle's part which would most naturally fit in with a nearness in composition of the respectively related Epistles. Whatever may be said,

however, as to the reasonableness of either line of argument, it is quite clear that the passage regarding the variant preachers in Rome (i. 14-18), with its bearing upon the state of the Roman Church when the Apostle wrote his letter to it, must be fully understood before the question of the date of this Philippian letter can be finally settled. To this study is being directed to-day.

Bibliography. Besides the standard New Testament introductions, consult the following commentaries and discussions: Klöpper (Gotha, 1893); Lightfoot (London, 1894); Haupt, in *Meyer-Kommentar* (Göttingen, 1897); Lipsius, in *Holtzmann Hand-Kommentar* (Freiburg, 1892); Moule, in *Cambridge Bible for Schools* (Cambridge, 1893); id., *Philippian Studies* (London, 1897); Vincent, in *International Critical Commentary* (New York, 1897); Baur, *Paulus* (Eng. trans., Edinburgh, 1873-75); Spitta, *Zur Geschichte des Urchristentums* (Göttingen, 1893); Clemen, *Die Einheitlichkeit der paulinischen Briefe* (Göttingen, 1894); Gifford, *The Incarnation* (New York, 1897); Holsten, *Paulinische Theologie* (Berlin, 1898).

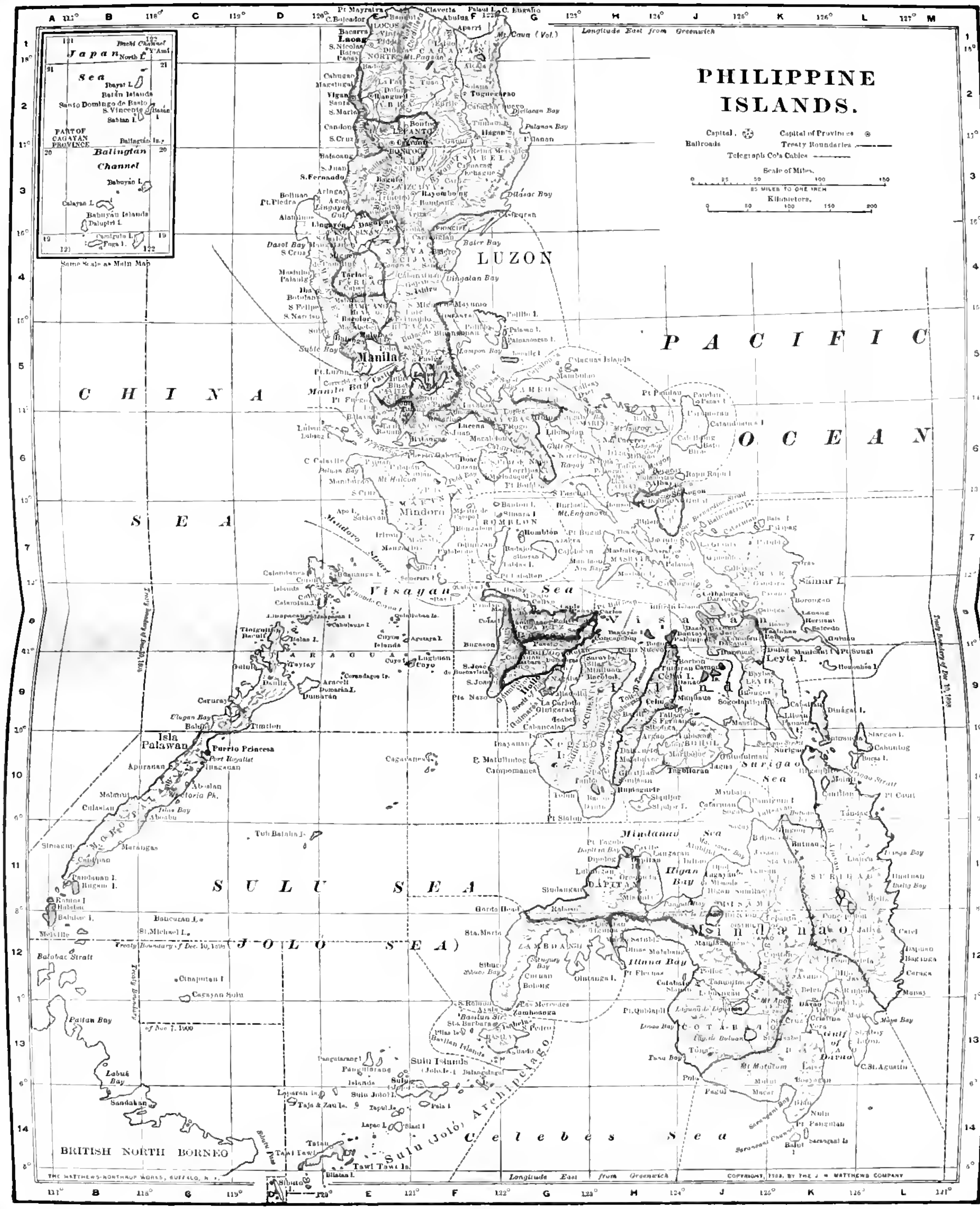
PHILIPPICS. See Cicero; Demosthenes.

PHILIPPINE ISLANDS. An archipelago forming the most northern group of islands in the Malayan or Eastern Archipelago. It lies wholly within the tropics. The land surface extends between latitudes 21° 10′ and 4° 40′ N., 1150 statute miles; the east and west limits are longitude 116° 40′ and 126° 34′ E., making about 650 miles. The most northern land in the Philippines is Y'Ami Island, of the Batanes group; the most southern is Balut Island, of the Sarangani Islands, south of Mindanao; the most western is Balabac Island, north of Borneo; and the most eastern is Sanco Point, on the east coast of Mindanao. The archipelago is bounded on the north and west by the China Sea, on the east by the Pacific Ocean, and on the south by the Sea of Celebes and the coastal waters of Borneo. It is 93 miles distant from foreign territory on the north (Formosa); 31 miles from Balambangan, an island near Borneo, on the south; 510 miles from the Pelew group (German) on the east, and 515 miles from Cochin-China (French) on the west.

The archipelago numbers about 1600 islands, most of them very small, and having altogether about 11,500 miles of coast line. Two of them, Mindanao and Luzon, are, however, classed among the larger islands of the world, and eleven islands, Luzon, Mindanao, Samar, Panay, Negros, Palawan (Paragua), Mindoro, Leyte, Cebú, Masbate, and Bohol, are of primary geographical importance. The others are mainly dependent islands or islets along the coast of the large islands or subordinate archipelagoes like the Sulu Islands. The area of the total land surface is computed at 127,853 square miles, or a little larger than the New England States, New York, and New Jersey together. Mindanao (45,559 square miles) and Luzon (43,075 square miles) comprise about seven-tenths of the total land surface, the area of the other leading islands being: Samar, 5198 square miles; Negros, 4839; Panay, 4752; Palawan, 4368; Mindoro, 4050; Leyte, 3872; Cebú, 1668; Bohol, 1400; and Masbate, 1230. The total water surface within the limits occupied by the archipelago is 705,115 square miles.

Topography. This immense labyrinth of islands forms that part of a vast submarine plateau which has emerged above the ocean. The surrounding waters are shallow, for the most part not over 200 feet in depth, showing that the wide plateau on which the islands stand nearly approaches the surface. But strewn here and there over the sea floor are troughs and hollows and wide depressions, particularly to the west of Luzon and Mindanao, where greater depths are found. There is nothing approaching oceanic depths till the eastern edge of the submarine plateau descends to the Pacific deeps from 100 to 300 miles east of the archipelago. In the south three lines of islands stretch like isthmuses between the main archipelago and the southern lands. In the northwest is the most regular and best developed of these isthmuses, stretching from Mindoro to North Borneo, the long, narrow island of Palawan forming more than half its extent. In the centre the Sulu Archipelago connects the western terminus of Mindanao with the northeastern point of Borneo; and in the southwest the great peninsula of Celebes with the Sanguir Archipelago and other islands forms another isthmus, sweeping around to the south of Mindanao. These ridges are extended throughout the archipelago in the form of mountain ranges, from south to north, and form a large part of its relief. From the southern coast of Mindanao to the north of Luzon the mountains are disposed in a line with or parallel to the southern isthmuses. The whole interior is essentially mountainous, the Cordilleras extending north and south, their highest peaks ranging from 3720 to 10,312 feet (Apo in Mindanao), with outliers and ramifications partly filling the gaps between the ranges. Narrow plains occur between the mountains and wider ones where the river valleys broaden near the coast, and are enriched with alluvial deposits. Mountains are the backbone of all the islands, though in Leyte there are no mountains of special prominence. Three ranges in Luzon and four in Mindanao are the dominating features in the topography of those largest islands. The wider plains are in the basins of the larger rivers of Mindanao and Luzon. Owing to the predominance of mountains, the area of tillable lands is not believed to be one-third of the total area.

Hydrography. In the smaller and narrower islands the mountain chain which is the backbone of each island is the great central water-parting, streams flowing to the sea on either side of it in short, straight courses. Mindoro, for example, has about 60 independent little rivers. The drainage of the larger islands is more complicated, the parallel arrangement of the mountain chains giving space for the development of considerable streams. Among them is the Rio Grande de Cagayan (q.v.), with a drainage basin of 16,000 square miles, or much more than one-third of Luzon. All the interior waters of Northeastern Luzon are tributary to the Cagayan, reaching the China Sea on the north coast of the island. All the interior waters of Central Luzon, south of the Cagayan basin, are included in the system of the Rio Grande de la Pampanga, which empties through a wide delta into Manila Bay. The mountains are so near the sea in East Luzon that the rivers of that coast are of small importance excepting the Bicol in the southeast, which floats small vessels; but in the northwest the



PHILIPPINE ISLANDS.
Capital
Capital of Province
Railroads
Treaty Boundaries
Telegraph Co's Cables
Scale of Miles.
Kilometers.
Longitude East from Greenwich
LUZON
PACIFIC
OCEAN
CHINA
SEA
SULU SEA
(JOLO SEA)
Celebes Sea
Visayan Sea
Manila
Mindoro
Mindanao
Isla Palawan
Puerto Princesa
Samar I.
Leyte I.
Negros I.
Sulu Islands
Sulu (Joló) Archipelago
BRITISH NORTH BORNEO
Same Scale as Main Map
PART OF CAGAYAN PROVINCE
Balingtan Channel
Japan Sea
THE MATTHEWS-NORTHRUP WORKS, BUFFALO, N.Y.
COPYRIGHT, 1898, BY THE J. N. MATTHEWS COMPANY

Agno has 11 feet of water on its bar at high tide, which gives some importance to the port of Dagupan at its mouth. The Pasig is only 12 miles long, but as it connects Bay Lagoon (q.v.), or Laguna de Bay, with Manila Bay through the chief port of the island, it is a commercial highway of importance. The river systems of Mindanao, confined within the parallel ranges, have chiefly a north and south direction and are more important for navigation than those of Luzon. The Rio Grande de Mindanao, one of the largest rivers in the Philippines, drains the central basin of the island, carries the waters of many tributaries to the Celebes Sea on the west coast, and is navigable for gunboats as far as Lake Lagusan. The Rio Agusan (q.v.) rises about 25 miles from the south coast, and reaches the sea on the north coast, nearly dividing the island. It is navigable for a few miles from its mouth. The most important lakes in Luzon are: Laguna de Bay, 25 miles long and 21 miles wide, which receives numerous small streams from the mountains around it, and Bombon, 14 by 11 miles in extent. Taal volcano rising amid its waters. The largest lakes of Mindanao are Maguindanao, in the centre, and Malanao, near the north coast. Smaller lakes are scattered over the islands.

CLIMATE. As the archipelago is wholly within the tropics, the climate is naturally very warm. From November to February inclusive, the most temperate months, the temperature ranges from 75° to 80° F. The hottest months are April, May, and June, when the monthly mean ranges between 81° and 83°. The intermediate temperatures are in March, July, August, September, and October, when the mean is from 79° to 81°. The temperature at Manila rarely rises above 100° in the shade, and does not fall below 60°. The prevailing atmospheric humidity intensifies the discomforts of heat, from which there is little relief in the three hottest months; but in December, January, and February the nights are fairly cool. As the mean temperature for the year varies merely by a few degrees, only two seasons are recognized. In the wet season, from June to October, five months, the rains are very heavy in the interior and on the west coast, because the moist southwest monsoon there prevails. The east coasts do not share in the excessive precipitation, because they are shielded by the mountains. In the dry season, from November to May, the comparatively dry northeast monsoon prevails, there are many fair days, and the precipitation is greatest on the east coast. The rivers often overflow their banks during the wet season and wide areas in the larger islands are submerged; but the floods are not feared so much as the cyclonic storms of wind and rain known as typhoons, which seldom occur south of 9° N. latitude, but north of that line sometimes destroy the lives of thousands of persons and wreck many vessels and villages. Cyclones are most frequent in July, August, September, and October, when these whirling winds from the Pacific occasionally sweep the whole archipelago north of Mindanao. The most terrific of these storms recorded in the Philippines struck Manila in 1882, traveling at a velocity of 140 miles an hour.

The danger from epidemic diseases is not great except for the occasional visitations of cholera, which is difficult to control, as has been proved since the United States acquired the islands. Smallpox is always prevalent, but very seldom attains wide-spread development. The bubonic plague has never gained a strong foothold, though in 1901-02 the most strenuous efforts were required to suppress it. Malaria is prevalent in some islands, especially Mindoro, Balabac, and parts of Palawan, Luzon, and Mindanao, but large districts are entirely free from it. Malarial fevers and digestive troubles are the chief diseases. On the whole the health of the natives is fairly good, but the climatic conditions, except in some districts, are not favorable to long residence by Americans or Europeans. It is fortunate that some places among the mountains afford health resorts to which white persons may go for recuperation. Such an asylum is the elevated plateau of the small province of Benguet, 150 miles north of Manila, where, during the hottest month of the year, the temperature is not over 70° F. at midday.

FLORA. The vegetable life is rich and varied, with very few distinctive species, but some plants that are transitional between the flora of Formosa on the north and Borneo on the south. Sixty species of large trees afford the most valuable hard woods for the use of the ship-builders and cabinet-makers. Many other trees are so hard that they cannot be cut by the ordinary circular saw. The bamboo grows in numerous varieties, and, as in other parts of the Malayan Archipelago, is indispensable to the natives. The cocoa palm flourishes everywhere and many of the ripe nuts are collected in rafts and floated to market. The oil is used in cooking and as an illuminant. Other palms are very numerous. The banyan is common and grows to enormous dimensions, and the cinnamon, clove, and pepper are found wild in the southern islands. About 1200 genera and 5000 species of plants have thus far been recognized by botanists. Economically the most valuable of the wild plants is Manila hemp, the fibre of a wild plantain (*Musa textilis*). The plant closely resembles the edible banana in appearance and grows best on shaded hillsides at moderate elevations. The export crop is raised on plantations, which yield, when carefully managed, an annual return of 30 per cent. on the capital invested. This fibre is not successfully raised elsewhere except on a few plantations in North Borneo. Practically all the cultivated plants of the South Asian island world are successfully raised, including rice, sugar, tobacco, coffee, cacao, maize, and sweet potatoes.

FAUNA. The islands are poor in indigenous mammals. The most important animal is the carabao or water buffalo, which is caught young, tamed, and universally employed as a draught animal, while his tough flesh is valued by the natives as meat. He is usually docile, but is slow and lazy and during the heat of the day will not work more than two hours at a time without his mud bath. The female gives abundant milk, from which *ghee*, a kind of butter is made. The hide makes valuable leather. The timarau, a small buffalo living in the jungles of Mindoro, has never been tamed; it often attacks and kills the larger carabao. A small humped variety of cattle are raised in large numbers for beef on some of the islands. Goats are common and are utilized both for milk and flesh. There are several species of deer, and both wild and domesticated hogs are very abundant. The larger horse as known in America and Europe, does not thrive, but the Philippine

pony, originally from Spain, is an excellent saddle horse, and useful in teams as a carriage horse, but not strong enough for heavy work. The carnivora have no large representatives, and only a small wild cat, two species of civet cats, and the binturong are conspicuous. The islands have nearly 600 species of birds, among which are the jungle fowl, hornbill, fruit pigeon, the snipe, curlew, and other waders; also the species of swift whose nests (edible birds' nests) are highly esteemed in China as an article of food. Marine fish are far more important than fresh-water fish and form the largest part of animal food, the natives also eating many varieties of 'shell fish.' The pearl oyster, yielding a considerable quantity of shell and jewels, is fished in the Sulu Archipelago. Crocodiles and snakes are abundant. Swarms of locusts sometimes devastate the fields, and rice and tobacco have other insect enemies.

Geology and Mineral Resources. The geology of the archipelago has not yet been systematically studied. In broad outline the islands appear to consist of ancient eruptive rocks that have been covered by volcanic outpourings of the Tertiary, Quaternary, and present epochs, and in the lower levels by alluvium. Fossils are not found in the higher altitudes, and deposits of marine fossils are of small extent in recent geological times. There are twenty-three well-known volcanoes, of which eleven are more or less active. The most famous among them, and perhaps the most beautiful volcanic cone in the world, is Mayón, or the volcano of Albay, near the Bay of Legaspi, in Southeastern Luzon. Mayón is 8274 feet in height, and some of its eruptions in the past three centuries have been very serious. The surrounding country has been well-nigh buried under its streams of lava, and its clouds of volcanic dust have been carried through the air as far as the coast of China. Another remarkable volcano is Taal, which is an island in the middle of Lake Bombon, Luzon, with an area of 220 square miles, built up from the bottom of the lake by the outpourings from several craters. The archipelago is a centre of seismic as well as volcanic energy, and the volcanic centres are often the sources of the severest earthquakes. Most of the very violent shocks from which Manila has suffered, for example, have radiated from the Taal centre. For the eighteen years 1880-97 there was an average of 53.4 earthquake days in the year, or 4.5 per month.

The mineral resources are supposed to be very large, but their extent is not yet known. Better transportation facilities and more capital and labor will be required to develop these sources of wealth. True coal has not been found, but the highly carbonized lignite of Tertiary age which takes its place is supposed to be the chief mineral product. It is a fairly satisfactory fuel for steamers, and is widely distributed over the archipelago, especially in Luzon, Mindoro, Masbate, Panay, Samar, Cebú, Negros, and Mindanao. At present it is mined chiefly in Cebú, where as soon as the transportation shall have been perfected the output is expected to be 5000 tons a month. Gold is found in many localities, and has long been mined by natives, employing very rude and wasteful methods. Explorations have proved that the alluvial deposits in many parts of Luzon, Mindanao, and other islands are extensive, and gold-bearing quartz is found among the mountains of Northern Luzon, in Mindanao, and elsewhere, some of it being crushed by the natives between heavy stones and the metal extracted by washing. The prospects of gold-mining in Luzon are very favorable. Copper ore is reported from many islands, but the deposits have not yet been worked to any extent. Iron ore is abundant in Luzon, Cebú, Panay, and other islands. Some of the ore of Luzon yields 85 per cent. of pure metal, but thus far the ores are almost unworked except to a small extent in Luzon. Silver occurs in association with lead; sulphur may be obtained in large quantities around some of the volcanoes; and salt, gypsum, and a few other minerals of commerce are found.

Agriculture. Though agriculture is the most important source of wealth, it is in a very backward condition. Farming implements are of the most primitive sort. The cultivator, farm roller, and many other implements were never seen in the Philippines till the United States authorities opened the Government experimental farm. The natives do not understand the use of fertilizers, and know so little about forage crops that all the fodder for the horses and mules in the Government service has been imported. The indolence of the natives has also been unfavorable to large agricultural development. Nearly all the tilled lands are between sea level and 700 feet above the sea. The staple products in order of importance are Manila hemp (abaca), tobacco, sugar, coffee, and rice. Hemp is produced chiefly in the provinces of Luzon south of Manila, in the islands of Samar and Leyte, and on a smaller scale in the other islands north of Mindanao, and on the north coast of Mindanao. The bast, or fibrous outer leaf, yields the coarse, strong fibre which is the best material for sailcloth and cordage. From the fibre yielded by the inner stalks are woven fabrics that are superior in softness and lightness. These fabrics are seldom exported, but the bast, of which, under the best conditions, 3000 pounds to the acre are produced, is the greatest export commodity, the average yearly shipments amounting to nearly 100,000 long tons. Cotton and ramie fibre are also produced to some extent, but cotton has declined, owing to the increased use of foreign textiles. Tobacco is of excellent quality, though it does not equal the favorite grades of the Cuban crop. The best leaf is grown on the wide plain of the Rio Cagayan (Isabela and Cagayan provinces), North Luzon. This favored tobacco region supplies most of the leaf sent to foreign lands or manufactured in Manila. The inferior, though good, tobacco grown in the more southern islands is chiefly consumed at home, but the leaf of North Luzon is famous throughout Southeastern Asia and many Western countries. Sugar-cane, grown in all the islands, is of great importance, and though it is cultivated with little intelligence, and raw sugar is produced by the crudest methods, its value for export is second only to that of hemp. The coffee of Luzon and Mindanao is of excellent quality, comparing favorably with Java, but the crop has declined on account of insect enemies. Rice is grown everywhere, and is the great food staple of the common people. It was formerly exported to China, but for years the supply has been short of the home demand, and large quantities are imported from Cochin-China. Maize thrives throughout the archipelago and is grown especially on land that is not fitted for rice. While its use as food is

increasing, many natives do not eat it. Among other products are cocoanuts, cocoa, wheat, indigo, sesame, peanuts, many varieties of vegetables, and spices in the south. Large quantities of copra, the dried meat of the cocoanut, are prepared for export. The pastoral industries are extensive. Some of the islands, as Masbate, have comparatively little tilled ground and depend more largely upon live stock. It is estimated that Masbate has 10,000 carabaos, 55,000 cattle, and 5000 horses. Cattle of a small humped variety are raised for beef on several islands. Swine and fowls are found in every native settlement. The Government experimental farm near Manila is for the purpose of encouraging the production of crops. Experiments with alfalfa and other forage plants have been very successful, and most of the vegetables grown in the United States, excepting melons and white potatoes, yield well. The Government distributes seeds and is giving special attention to coffee-growing. Very little land is owned by the peasantry, who rent their small holdings, paying half the crop to the owners. About 500,000 acres of the best tillable lands are owned by three of the Roman Catholic societies which do not encourage thrifty farming; it is likely that their lands will be purchased by the Government and sold to the tenants. The settlement of the land question is of the highest importance, as it is impossible in most cases to give a safe title to lands.

MANUFACTURES. The most important manufactures are the products of the tobacco works. The largest tobacco factory in Manila has over 10,000 employees. Most of the natives smoke home-made cigars, and over 150,000,000 cigars are annually exported. The leaf is cured and manufactured by means of modern machinery, many of the cigarette machines are worked by steam, and Manila is the chief centre of all tobacco products. Fabrics of Manila hemp, wool, cotton, silk, and piña fibre are woven on hand looms; and bamboo, rattan, palm leaves, and other material are used with intelligence and skill in making mats, hats, bags, cigar cases, and a large variety of other articles. Rope, soap, leather, sugar, and some other commodities are made by antiquated and imperfect processes, but much skill has been developed in erecting the better class of buildings, and in making furniture and wood carvings.

COMMERCE. Trade relations with foreign countries have grown rapidly since law and order were restored throughout most of the islands about the beginning of 1900, as the following table, giving the value of exports and imports, shows:

	1900	1901	1902
Exports	$19,751,068	$23,214,948	$29,000,000
Imports	20,601,436	30,279,406	34,342,166

The large increase in the trade between the Philippines and the United States is shown by the following table:

	1898	1899
Exports to the United States	$3 [illegible] 415	$4,409,774
Imports from the United States	127 804	404 193

	1900	1901	1902
Exports to U. S.	$5,971 208	$4,420,912	$6,632,700
Imports from U. S.	2,640,449	4,027,004	5,251 867

The trade in 1901 with the other countries that are most important in Philippine commerce is indicated in this table:

	United Kingdom	Hong Kong	British East Indies
Imports from	$6,956,145	$4,529,322	$2,820,797
Exports to	10,704,731	5,067,547	1,314,084

	Spain	France	French East Indies
Imports from	$2,166,866	$1,684 233	$1,914,238
Exports to	1,656,409	1,934,256	1,486

The exports consist very largely of agricultural products. Manila hemp and sugar, the leading staples of the islands, are the principal factors in the trade, their combined value usually amounting to more than 75 per cent. of the total export valuation. In 1900 the value of the principal exports was: Manila hemp, $13,290,400; sugar, $2,397,144 (smaller than usual); copra and cocoanuts, $3,184,853 (unusually large); cigars and cigarettes, $1,164,369; leaf tobacco, $1,033,900; hides and skins, $311,183. The exports were classified as: Products of agriculture, 87 per cent.; manufactures, 7 per cent.; miscellaneous, 6 per cent.

The imports are chiefly manufactured articles, cotton goods usually forming one-third to nearly one-half of the total, and foodstuffs. Rice is the most important of the agricultural imports. The value of the chief imports in 1900 was: Cotton manufactures, $8,727,777; rice, $4,365,056; iron and steel articles, $1,425,233; wheat flour, $475,236; malt liquors and cider, $1,113,684; mineral oils, $374,717; silk manufactures, $385,984; glass and glassware, $395,620.

Manila hemp is almost the only article imported into the United States, the value of the fibre brought to this country in 1902 amounting to $6,318,470.

Great Britain leads in the foreign trade with the Philippines, chiefly on account of its large purchases of Manila hemp and its surpassing sales of cotton cloth. The United States supplies more foodstuffs, excepting rice, which comes from Cochin-China, than any other country; and its sales of iron manufactures to the islands in 1902 amounted to $957,342. In the same year the imported foodstuffs amounted to over $14,000,000, or about two-fifths of the total imports.

TRANSPORTATION AND COMMUNICATION. The three leading ports of the islands are Manila, Cebú, and Iloilo. The situation of Manila (q.v.) gives it superior advantages in the domestic and foreign trade of the islands. Vessels, however, having a draught of more than sixteen feet are compelled to anchor two miles from the shore, and are dependent upon lighterage for loading and unloading cargoes. The Government intends to dredge an inshore harbor and protect it by breakwaters, so that the largest vessels may tie up at the docks. Cebú and Iloilo are the chief ports of the islands of Cebú and Panay, respectively, in the Visayan or great central group of islands between Luzon and Mindanao. There are also three ports of secondary importance: Aparri, on the north coast of Luzon, a large centre of tobacco shipments; Zamboanga, the leading port of Mindanao; and Jolo, the chief port of the Sulu Archipelago, in the south. Custom houses are maintained at these six ports, and

they are open to foreign trade. In addition to these ports there are a large number of local ports whose business is confined to the coastwise trade. Many of them are connected directly by small steam and sailing vessels with the ports engaged in the foreign trade. As the islands lack railroads and have very few roads of any description, they are dependent upon this large coasting trade for the distribution of their domestic commerce or for the dispatch to or receipt from foreign countries of articles in the foreign trade. Thus the leading ports are the forwarding and distributing points for the entire over sea commerce. There are, for example, about thirty local ports at which the Manila hemp crop is collected for shipment to Manila, Iloilo, and Cebú, where it is transferred to vessels in the foreign trade. The freight rates on these coasting lines are high.

All the ports are reached from the interior by small rivers, or by bad cart roads or footpaths. These paths and trails extend from the ports in all directions, but are very inadequate, and commerce is hampered by the poor inland communications. The only railroad extends from Manila north to Dagupan, on Lingayen Bay, 120 miles. It is estimated that the islands require at least 1000 miles of railroad as a factor in their development.

The islands are fairly well supplied, through the three leading ports, with transportation to foreign lands. They have direct steam communications with all the leading ports of South Asia, Australia, San Francisco, and Barcelona, Spain. A large amount of the freight, however, is transhipped at Hong Kong and other Asian points, where it meets the steamships of the regular lines in the European and American trade. In 1901, 789 British, German, Chinese, and other foreign vessels entered the ports of Manila, Iloilo, and Cebú. Very little of the trade even with the United States is carried in vessels flying the American flag. In 1902 about 94 per cent. of American sales to the Philippines and 99 per cent. of American purchases were carried in foreign bottoms. Since August, 1898, the Signal Corps of the United States Army has laid 1327 miles of cables between the islands and 5000 miles of permanent telegraph lines, so that most parts of the archipelago have now the means of rapid communication with one another. In 1903 direct electrical communication with the United States was opened by means of a Pacific cable between the east coast of Luzon and San Francisco by way of Guam, Midway Island, and Honolulu. Manila is also connected by cable with Hong Kong and the European system.

BANKING. There are three general banking corporations in the islands. The Banco Español-Filipino, at Manila, with a branch at Iloilo, monopolizes the bank-note circulation of the Philippines, amounting to 2,407,560 pesos (a peso = 50 cents). Its capital is 1,500,000 pesos. The Hong Kong and Shanghai Banking Corporation has branches at Manila and Iloilo, and the Chartered Bank of India, Australia, and China at Manila and Cebú. The aggregate liabilities of all these establishments on December 31, 1901, was 53,415,809 pesos, including deposits of 35,012,127 pesos. The Savings Bank and Pawn Shop of Manila, capitalized at 221,460 pesos, had in January, 1902, deposits amounting to 755,829 pesos and total resources of 1,096,597 pesos.

FINANCE. The central government is supported chiefly by import and export duties. The provincial and municipal governments derive their support from internal taxes. The revenues and expenditures in the archipelago from the date of the American occupation, August 20, 1898, to the end of the fiscal year, June 30, 1901, were as follows:

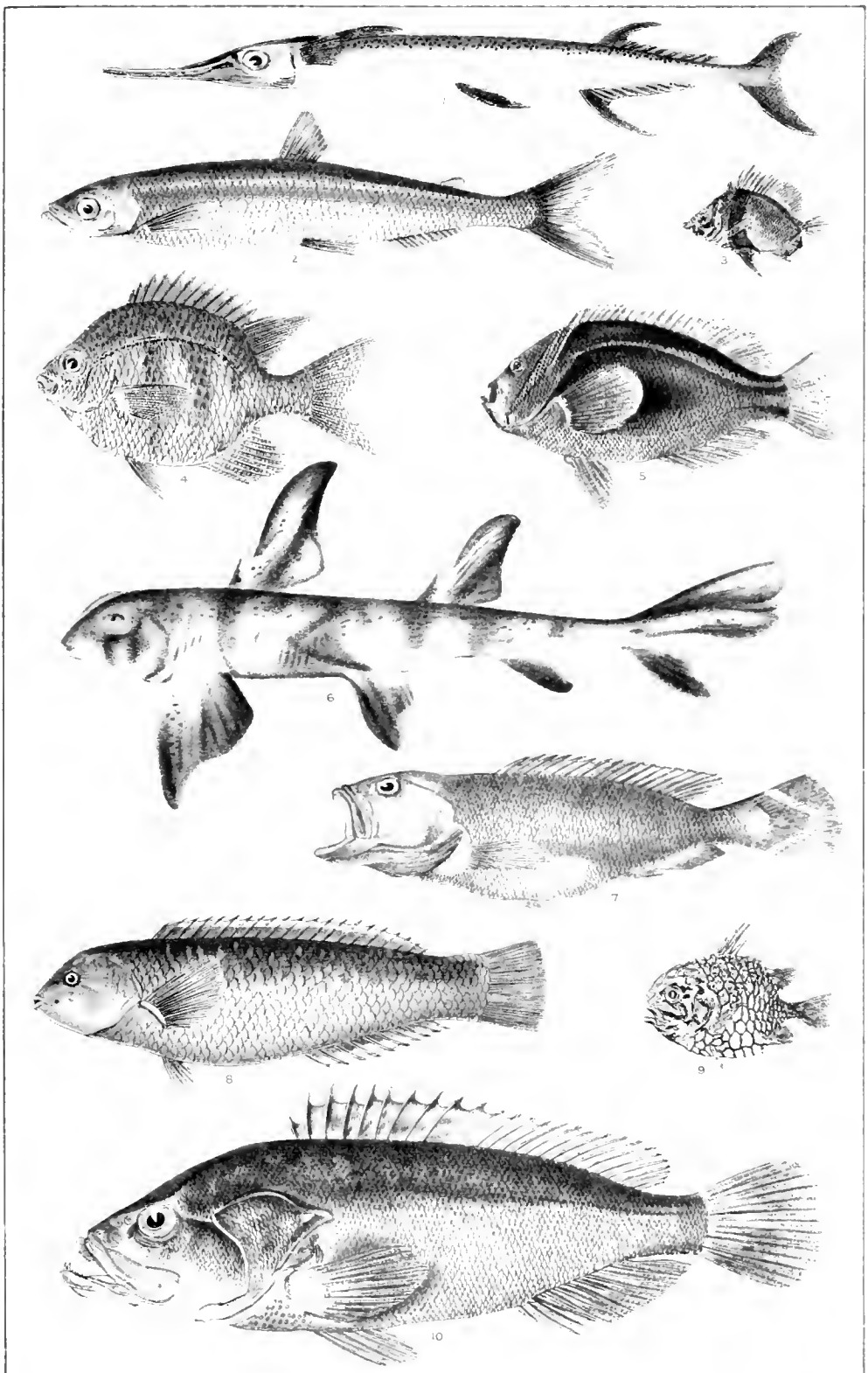
REVENUES	1899	1900	1901	Total
Customs	$3,097,864	$5,535,952	$9,032,600	$17,666,417
Postal	42,954	104,282	121,559	268,796
Internal	240,378	522,509	932,484	1,695,372
Miscellaneous	130,131	361,195	591,017	1,082,344
Total	$3,511,327	$6,523,938	$10,677,660	$20,712,929
EXPENDITURES				
Customs	$29,177	$134,685	$280,815	$444,678
Postal	30,410	89,149	147,031	266,591
Other expenditures	2,337,810	4,994,545	6,335,975	13,668,331
Total	$2,397,397	$5,218,379	$6,763,821	$14,379,600

One-half of the internal revenue receipts in each province is turned over to the provincial treasury, and the remaining one-half to the municipalities of the province. A poll tax of $1 Mexican is levied upon each male person between eighteen and fifty-five years of age, one-half being paid into the treasury of the town where he lives and the remainder into the provincial treasury. The municipal council may license saloons and other business requiring police supervision. An ad valorem land tax is collected for the benefit of the provincial and municipal governments, the provincial board levying one-eighth of 1 per cent. on the assessable land for roads and bridges, and may levy two-eighths more for general purposes. The municipal council is required to levy one-fourth of 1 per cent. for schools, and may levy one-fourth per cent. more for general purposes.

WEIGHTS, MEASURES, AND MONEY. The coinage in use comprises the Mexican silver dollar, and silver peso and fractional currency coined at the Manila mint, which was established in 1902. A large amount of pesos coined at the Philadelphia mint are sent to the Philippines in 1903. The Philippines silver coins are legal tender to the amount of $10. Two pesos are exchanged for $1 of United States money, and a ratio of 2 to 1 is maintained between Mexican dollars and United States gold. The metrical system of weights and measures is officially in use, but the Spanish denominations are also employed.

POPULATION. A census of the Philippines was

FISHES OF THE PHILIPPINES



JULIUS BIEN & CO. LITH. N.Y.

1 GREAT GAR - (BELONE GIGANTEA)
2 SMELT - (OSMERUS JAPONICUS)
3 FLAG - FISH - (HENIOCHUS MACROLEPIDOTUS)
4 A DEMOISELLE - (GLYPHIDODON SMARAGINUS)
5 AMPHIPNION FRENATUS
6 PORT JACKSON SHARK - (CESTRACION PHILIPPI)
7 A GROUPER - (SERRANUS URODELUS)
8 FOUR-COLORED WRASSE-(JULUS QUADRICOLOR)
9 CONE-FISH-(MONOCENTRIS JAPONICUS)
10 A SEA-BASS (SERRANUS MARGINALIS)

in Congress when the insurrection began in 1896, and the American authorities found returns for over two-fifths of the population stored in Manila. The returns were made the basis for the estimate of the population in the twelfth census of the United States, where it is given as 6,961,339. A later Government estimate is 6,975,073, with 1137 towns, the population being divided among the island groups as follows:

GROUPS	Area *sq. miles*	Population	Towns
Luzon	44,235	3,727,488	570
Marinduque	681	48,000	6
Mindanao	46,721	495,650	130
Mindoro	4,108	106,200	19
Palawan	5,037	52,550	14
Sulu Archipelago	1,029	22,630	14
Visayan Islands	25,302	2,495,908	381
Unassigned	740	24,858	3
Total	127,853	6,975,073	1,137

With the exception of Manila, the capital, which has a population of 350,000, there are no cities in the archipelago with more than 40,000 inhabitants, though there are about 30 towns with populations between 20,000 and 40,000. The most important of these are Albay, Batangas, Banan, Laoag, Lipa, and Taal in Luzon, Cebú in the Visayas, and Zamboanga in Mindanao.

EDUCATION. There is considerable controversy as to the exact status and results of the system of education in operation before the American occupation. It is contended, on one hand, that the provisions for primary and secondary education were largely neglected, the tendency being to centre efforts upon the few who were sent to the college or university. It is accordingly asserted that comparatively few persons stood out prominently as educated Filipinos, while the great mass were either wholly illiterate or could barely read and write. Other authorities maintain that the Spanish system, considering the conditions which existed, achieved fair results. The report of the United States Commissioner of Education states that "the public elementary school system required by the Spanish law, whatever its defects, was widely diffused over the archipelago when the Americans arrived." In some places the average of those who could read and write was high, in others low—a diversity due to local conditions. Higher education was well provided for, and presented many admirable features. Since September 1, 1900, the civil administration has put in force an educational bill designed to provide wider instruction for the masses as well as the more prosperous class. The archipelago has been divided into seventeen educational divisions, with an American superintendent over each division. Up to 1903 about 1000 American teachers had been distributed for primary work in the towns; 200 American teachers for secondary work were also assigned to duty; 200 soldier-teachers were detailed from their regiments; and 3400 Filipino teachers were also appointed. Instruction in the English language was provided in 1500 schools, in which more than 200,000 children were enrolled. Night schools were opened in various parts of the archipelago, with an enrollment of about 25,000 pupils. Grammar and high schools are a part of the system. Permanent normal schools and vacation normal courses for the training of Filipino teachers were organized. In 1903 plans were under discussion for increasing the number of trade schools and establishing schools of painting, sculpture, drawing, and music, and also a university at Manila. The aim of the common schools is in part to fit the Filipinos for practical work and to make a feature of agricultural and industrial training.

RELIGION. Under the treaty of peace of December 10, 1898, religious freedom is guaranteed to all. The people of the islands are largely Roman Catholic, though there are moon-worshipers, Mohammedans, Buddhists, etc. The Moros, living in the south, and the pagan wild tribes of the mountains, are the leading non-Christian classes. As shown by the Church registry in 1898, 6,559,998 Roman Catholics were distributed among 746 regular parishes, 105 mission parishes, and 116 missions. Most of the parishes are administered by Spanish friars of the Dominican, Franciscan, and Augustinian Orders, assisted by many native priests in the small parishes and missions, though since the American occupation several priests from the United States have been appointed to bishoprics. Controversy exists here also in regard to the attitude of the native population toward the friars. Some assert that they are obnoxious to a large part of the people, owing to the onerous contributions they are said to have levied for the support of the Church, and the large areas of tillable land they acquired, much of it, it is asserted, by dispossessing the owners on the pretext of exacting the Church's dues. The apologists of the friars, on the other hand, vigorously assert that their unpopularity is only with a faction of the natives, and springs largely from political motives. They call attention to the fact that a counter-movement of popular origin and considerable proportions has taken place in favor of the friars. When Spanish sovereignty ceased, many members of the Orders retired to Spain, and the policy of acquiring their lands and delegating their powers to other officials of the Church has been advocated in reports of the Philippine Commission.

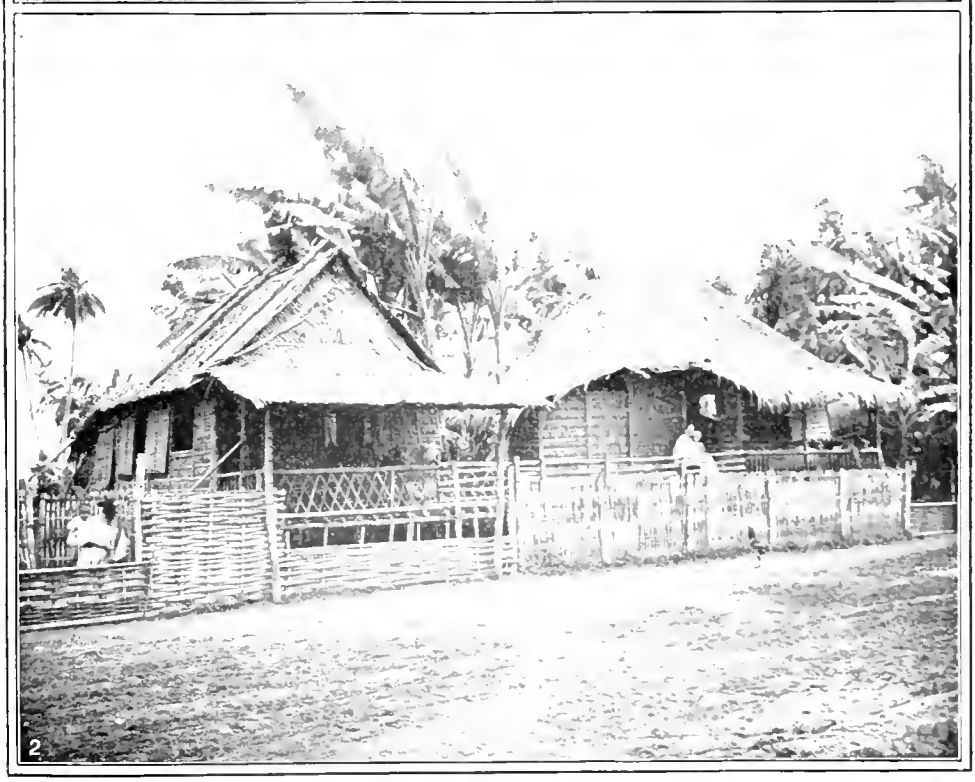
GOVERNMENT. For a time after the transfer of the Philippines to American control, the islands were held under military government subject to the orders of the President of the United States. In January, 1899, a commission was appointed by the President to investigate conditions in the Philippines. (See below under HISTORY.) In February, 1900, the provisional government of the islands was intrusted to a new board of civil commissioners, five in number, at the head of which was Judge William H. Taft of Ohio. The other members were D. C. Worcester, Luke E. Wright, Henry C. Ide, and Bernard Moses. The commission reorganized the local civil governments and in January, 1901, established a municipal code for the government of cities other than Manila and tribal settlements. An electoral system making the qualifications for suffrage the ownership of property, payment of certain taxes, or a knowledge of English or Spanish was also created. A constitution for the government of the provinces enacted by the commission provided that their officials should be a governor elected by the municipalities subject to the approval of the commission, and a secretary, a treasurer, a commissioner of public works, and a public prosecutor, all appointed by

the commission. From time to time the commission instituted civil governments in the localities as circumstances required, until in 1903 more than 700 localities had local governments suited to their conditions. In June, 1901, the civil and military administration of the islands were separated by the appointment of Judge Taft as civil governor, thereby relieving the military governor of his civil duties in the pacified provinces. Shortly thereafter the commission was increased from 5 to 8 by the addition of three natives and was reorganized so as to place each member at the head of an administrative department. By an act of the commission dated June 11, 1901, the judicial system was reorganized. A Supreme Court was created to consist of seven justices, four American and three native; and sixteen Courts of First Instance, over which natives presided, were established. A considerable portion of the minor criminal jurisdiction was transferred to justices of the peace. A new code of civil procedure, authorizing the use of either English or Spanish in judicial proceedings, went into effect September 1, 1901. The city of Manila, the capital, is governed by a board of three commissioners somewhat after the manner in which the city of Washington is governed. In addition to the above measures the present constitution of government for the Philippines consists of the order of April 7, 1900, creating the Philippine Commission and defining its powers; that of June 21, 1901, creating the offices of Governor and Vice-Governor; an act of the Philippine Commission of September 6, 1901, organizing the departments of the interior, of commerce and police, of finance and justice, and of public instruction; and the important act of July 1, 1902, for the temporary government of the Philippines, which continued the government established under the above-mentioned orders and acts.

The act of July 1, 1902, defined the citizenship of the Philippines as including all the inhabitants of the islands who were citizens of Spain at the date of the ratification of the treaty with Spain, February 6, 1899, and declared that as such they should be entitled to the protection of the United States. The substance of the bill of rights of the Federal Constitution, except the right of maintaining a militia and the right of trial by jury, was extended to the Philippines. The act directed the President of the United States to have a census of the islands taken, and within two years thereafter, if peace prevailed in the islands, a legislative assembly should be called into existence. This body is to consist of two chambers, the Philippine Commission constituting the upper one, while the Lower House is to consist of from fifty to one hundred popularly elected delegates apportioned among the provinces on the basis of population, except that each province shall be entitled to at least one member. Persons qualified to vote for delegates include those who have held office under the Spanish régime or who own property of the value of $250 or pay taxes amounting to $15 or over, or who speak, read, and write Spanish or English. Two resident commissioners to the United States are to be chosen by the Legislature, and both commissioners and delegates are to be chosen biennially. The Legislature is to hold annual sessions; but if at any session the Legislature refuses to vote the moneys or supplies for the support of the Government, the executive may appropriate sums equal to the amount last appropriated.

The Supreme Court, the Courts of First Instance, and the Municipal Courts as established by order of the Philippine Commission June 11, 1901, are continued. The United States Supreme Court is given appellate jurisdiction over all judgments of the Philippine Supreme Court in cases involving more than $25,000, or whenever the Constitution, the laws, or any right or title claimed under the authority of the United States is drawn in question. The Governor, Vice-Governor, members of the Philippine Commission, heads of executive departments, and the justices of the Insular Supreme Court are to be appointed by the President of the United States, with the advice and consent of the Senate. Congress reserves the power to annul all laws passed by the Philippine Legislature, and the Philippine Commission is directed to make annual reports of all receipts and expenditures to the Secretary of War. The Division of Insular Affairs instituted by the War Department is continued as the Bureau of Insular Affairs, and to this bureau are committed all matters pertaining to civil government in the insular possessions of the United States subject to the jurisdiction of the War Department. By a proclamation of July 4, 1902, the President of the United States declared the Philippine insurrection at an end everywhere except in the Moro territory and abolished the office of military governor, his authority in civil matters being superseded by that of the Philippine Commission.

Ethnology and Customs. The inhabitants are unequally divided between blacks, browns, yellows, and whites, and there is also a slight representation of reds. The blacks comprise native tribes, with descendants of African negroes and Papuans introduced by Spaniards. The native blacks are of Negrito type, commonly called Aeta, from a principal tribe; they are dwarfish in stature, and dwell in remote parts of the archipelago. They are usually regarded as the aborigines, and as remnants of a pigmy race; some students consider them degraded Papuans. There are only twenty thousand of them. The brown race, either pure or mixed, constitutes nine-tenths of the population. A fraction are related to the Polynesians; yet the distinctness of this type is problematical, and the ethnologist finds his surest identities in the vast numbers of Malay peoples in the islands. The first immigrants were uncultured savages, whose descendants are now represented in the interior and the outskirts of the islands by living tribes. These were followed by incursions in historic times of Malay peoples having alphabets and a primitive culture. About B.C. 200 came the ancestors of many head-hunting tribes. The immigration of the Tagal, Visaya, Vicol, Ilocano, and other industrial tribes is assigned to A.D. 100-500. Third and last came the Islamitic or Moro invasion, occurring in the fourteenth and fifteenth centuries of our era, and brought to an end by Spanish conquest in the sixteenth century. At present the brown Malay is mixing with white and yellow peoples. The yellow or Mongoloid type exists in the Philippines partly as pure-blooded Chinese, Japanese, Siamese, and Cambodians, but principally in mixtures of various sorts. The Chinese held sway in Luzon for centuries, and after their rule was thrown off trade continued between them and the natives.



STREET SCENES IN THE PHILIPPINE ISLANDS

1. MALASIQUI 2. SAN CARLOS

It is improbable that these immigrations and blendings were numerous prior to the founding of Manila (1571) and the coming of Mexican and Peruvian silver in trade. So vigorous was the Chinese invasion afterwards that it threatened to overthrow the Spanish rule, while it resulted in the creation of a large mestizo population. The red or American race found its way into the islands on the Spanish ships sailing annually between Acapulco and Manila in the sixteenth, seventeenth, and eighteenth centuries. It was not so much a migration of peoples as of arts. There are evidences of small settlements of Mexican Indians in and about Luzon, and the civilized portions of the archipelago were enriched by maize, pineapples, tobacco, cacti, agaves, and the varied industries associated with them. The white race, in all its important elements, Hamitic, Semitic, and Aryan, was permanently mingled with the brown during the 250 years of Spanish domination. In Northern Luzon and in the mountainous and central portions of other islands the native blood has not been changed, but elsewhere the term 'pure-blood' has little meaning. This blending has been most rapid in the Tagal, Vicol, and Visaya tribes, which constitute the largest fraction of the population.

The Negritos are small in stature, with closely curled hair, yellow sclerotic coat, and white teeth, which they file. They are among the shortest of mankind, the average stature being 1.47 meters (58 inches). Their cranial capacity is 1100 to 1200 cubic centimeters, and their cranial index 85. The Malay or brown Filipinos are of dark chocolate color and average 1.50 meters (59 inches) in stature. Some are meagre in body, but most of them are sturdy.

Culture among the Filipinos extends from the low savagery of the Negrito tribes to a form of civilization fairly comparable with that of the countries on the continent adjacent. The industrial life of the Filipinos is partly agricultural and mechanical, partly maritime. The outrigger canoe is in evidence about all the islands. Clothing is little needed as a defense against cold, but the need of protection from the sun's rays and the rain has quickened inventive faculty in devising a style of headgear which combines the functions of hat and umbrella, varying from island to island, with a rain cloak, also varying in form and material. The dwellings are made of bamboo, rattan, and palm leaves. The original fire-making device was the fire-saw, consisting of a section of bamboo stem, notched and laid on the ground and rubbed crosswise by another piece in shape like a knife; the bamboo fire syringe is also common.

Industrially the Filipinos are in the Iron Age. They have little machinery. All their tools are of the rudest sort, and are either Malay or Spanish. Many of them, especially the Moro tribes, work cleverly in metals, but do little at mining or reduction of ores. Their most elaborate work is done on the blades of edged weapons. Pottery is made by the brown peoples for domestic purposes; working in hard woods is a fine art, and in textiles the Filipinos excel. They split the bamboo and rattan into delicate filaments for hats and screens; make thread, twine, and rope of the native hemp; ornament their clothing and furniture with delicate vines and grasses; and weave the finest of cloth from the fibre of the pineapple. These fabrics are plaited by hand or wrought on looms, but it is difficult to tell which processes are Malayan and which came through Hispano-Mexican influences. The more advanced tribes rear a variety of small horse that is tough and serviceable; but the chief domestic animal is the carabao or water buffalo, which is largely used for turning water wheels for irrigation and as a draught-animal for plowing or hauling. Native transportation was originally by means of the buffalo, and rude water craft. Even before the coming of the Spaniards, the Chinese and the Japanese carried on a brisk trade with Manila and introduced their vehicles and money. During the 250 years of Spanish domination the 'groaning cart' and old-style water craft partly took the place of native devices.

The Negrito weapons of war and the chase are the bow with string of bamboo, and arrows with heads of wood or of iron procured in trade. The brown peoples have inherited from their ancestors edged weapons set on a hilt or a shaft. They carry also wooden shields, decorated with patterns cut in and rubbed with lime wash or mud. Firearms of many patterns are to be found. Fortification of the village is effected by path splinters and spiked pitfalls.

Fine art among the Filipinos had no separate existence, but the possession of a strong artistic sense is revealed by the taste displayed in their industries. Even the Negritos are not devoid of it. The dress of men and women; the metal working of the men, especially on their weapons; the exquisite textile work of the women all show artistic instinct. Under the influence of Spanish teaching and the inspiration of European and Christian motifs, some of the native Filipinos have attained distinction in painting and literature.

The principal tribes and languages are: Abaca, Abra Igorrote, Abulone, Adang, Aeta, Agutaino, Altaban, Apayao, Aripa, Atá, Bagobo, Baluga, Bangot, Barangan, Batak, Batane, Bicol, or Vicol, Bilane or Vilane, Bisaya or Visaya, Bonayanan, Buhuano, Bulalacaano, Bukidno, Bukil, Buquitnon, Cagayan, Calangan, Calaunian, Calana, Calinga, Caraga, Carolano, Catalangan, Catubangan, Cimarron, Coyuvo, Culáman, Dadayag, Dulangan, Dumagate, Durugnun, Eta, Gaddane, Gamungan, Guianga, Guimbahano, Guinaane, Halaya, Biligunyna, Hilloona, Ibalone, Ibanag, Ibilao, Ifugao, Igorrote, Hamut, Ilanos, Ilocanos, Hongote, Iraya, Isinay, Ita, Itaa, Italone, Itanega, Itetapane, Kiangane, Lutanga, Lutayo, Maguindanao, Malanee, Malanao, Mamámua, Mandaya, Mangnanga, Mangniane, Manobo, Mayoyao, Moro, Mundo, Nabaynngan, Negrito, Palanan, Pampango, Pangasinan, Quiangan, Sámale, Sameaca, Sangley, Sanguile, Silipan, Subano, Tagabaloye, Tagabawa, Tagabelie, Tagacaolo, Tagala, Tagbanua, Tandolano, Tinguian, Tinitian, Tino, Tirnray, Vico (Bicol), Vilane, Visaya (Bisaya), Zambale. Some of these names are also applied to localities, in which case the people may be called after the place, which is rare, or they may have given designation to the place, which is common. The more important tribes and languages are defined in their several places.

HISTORY.

In accordance with the terms of the Demarcation Bull of Pope Alexander VI. of May 4, 1493, the Spaniards were to make discoveries and to establish colonies beyond a meridian line in the Atlantic 100 leagues west of the Azores (later by

the Treaty of Tordesillas, June 7, 1494, 370 leagues west of the Cape Verde Islands), while the Portuguese were to confine their efforts to the field of discovery east of that line. In the race for the control of the spice trade of the East Indies the Portuguese came off victorious, for they reached the Moluccas or Spice Islands the year before Balboa discovered the Pacific Ocean, revealing that the Spaniards had found, not the Indies, but a great barrier continent that blocked the way thither.

The Moluccas lay so far to the east of India as to make it probable that if the demarcation line were extended round the earth they would be found to be in the Spanish half of the globe. It was to demonstrate this hypothesis and carry to completion the great design of Columbus to find a western route to the Spice Islands that Magellan undertook his voyage around America and across the Pacific. In March, 1521, he discovered a group of islands which he named after Saint Lazarus, whose festival was celebrated early in his stay among them. A few weeks later the heroic navigator lost his life in a skirmish with the natives. That he had achieved his project and proved that the Spice Islands lay within the Spanish half of the world was accepted by King Charles of Spain, but the impossibility of accurately determining longitude in those days, the difficulties of the voyage through the Straits of Magellan and across the Pacific, and financial necessities led him to relinquish all claims to sail or trade west of a new demarcation line, in the Antipodes, 297 leagues east of the Moluccas. (Treaty of Saragossa, 1529.) This really surrendered all rights to the newly discovered Islands of Saint Lazarus, which were slightly to the west of the Moluccas. The conquest of Mexico and the establishment there of the prosperous Viceroyalty of New Spain removed the difficulties presented by the navigation of the Straits of Magellan, and, in contravention of the provisions of the treaty, an expedition was dispatched to the islands in 1542 under the command of Villalobos. This expedition had no permanent result beyond giving to the group the name of 'Islas Felipinas,' in honor of the Prince, later King Philip II. The permanent conquest of the islands was achieved under Legaspi at the head of an expedition fitted out in Mexico. Legaspi arrived at Cebú in April, 1565. It was three years before his first reinforcements came, and five years before the conquest of Luzon was undertaken. In June, 1571, the city of Manila was founded, and this became the seat of the Spanish power. Within the next year great progress was made and at the time of Legaspi's death in August, 1572, the Spanish authority was securely planted in the islands and the conversion of the natives considerably advanced. Legaspi's force was small and the conquest was accompanied by relatively little bloodshed. The lack of social and political cohesion among the natives, the weakness of their religious beliefs, and the rivalries and hostility of the local chieftains opened the way for a patient and tactful prosecution of the policy of divide and rule; one chief after another was won over to the Spaniards, the picturesque ceremonials of the Church appealed to the artistic sense of the people, and the simple clan like social organization was skillfully utilized by the Spaniards as the basis of their rule. Lying on the extreme verge of the vast empire of Spain, the islands were commonly known as the Western Islands (Islas del Poniente), and until December 31, 1844, they were reckoned, so far as the calendar was concerned, in the Western Hemisphere, Manila time being about sixteen hours slower than Madrid time. The Portuguese protested against this invasion of their East Indian realm, but the conquest of Portugal by Spain in 1580 settled the question before there had been any serious collision. More formidable than the hostility of Portugal or the resistance of the natives were the incursions of Chinese pirates and later the attacks by the Dutch, who during their great contest with Spain made their way to the Indian seas and took possession of the Spice Islands.

The dominating impulse in this remote extension of Spanish power had been religious rather than commercial. The new conquest was to be an outpost of Christianity facing the great Asiatic heathen world. From it as a base the missionaries could prosecute their labors effectively in China and Japan. Religious purposes and interests continued to dominate the life of the islands for over three centuries. They never were in the true sense of the term a Spanish colony, but a great mission like the more familiar Jesuit missions in Paraguay and California. It is as a mission that the history of Spanish rule should be studied and its results estimated. To convert the natives, to collect them in villages where they would live under the oversight of the pastor with the faithful obedience of the flock to the shepherd and prepare themselves for salvation, was the simple ideal of the mission. That it was in a large measure achieved is the very general testimony of fairly dispassionate observers. The Christian population steadily increased, and the requirements of religion, while rigorously enforced, were not more burdensome than in Europe. There was little real oppression and hardly any exploitation of the people. Plantation slavery, the dark page in West Indian colonization, never existed. Schools were provided in the pueblos and in the larger towns hospitals and colleges; the native languages were given literary form, grammars and dictionaries were compiled and translations made of the simpler literature of the devotional life. The Christian population of the islands formed a unique community, the only large body of Asiatics permanently converted to Christianity in modern times. In its general framework the administration of the islands as a Spanish dependency was modeled on the system introduced into America, which in turn was an adaptation of that existing in the provinces of Spain. At the head was the Governor with viceregal powers, having by his side the Audiencia or Supreme Court. This body served not only as the highest court of appeal, but also as a check upon the arbitrary authority of the Governor. Another important restraint upon that official was the *residencia*, or obligation to stand ready to answer all charges of misbehavior which should be preferred during a period of six months, after the termination of his tenure of office. The heads of the provincial administration were the *Alcaldes Mayores*, whose functions were both executive and judicial. In his judicial duties the Alcalde Mayor was assisted by an assessor and a notary. The administrative division below the province was the pueblo or village, which was ruled by the Petty Governor, who was origi-

nally elected by the general suffrage of the married inhabitants of the pueblo, but in later years was chosen by a small body of thirteen electors. Within the pueblos the population was subdivided into little clan-like groups of forty or fifty families called barangays, a survival of the earlier native organization, each under a barangay headman (*cabeza de barangay*). Each family was assessed a tribute of 10 reals, about $1.25, and the headmen were responsible for its collection. The petty governors and headmen of barangays were Filipinos; the higher administrative officers were Spaniards. The inhabitants of these pueblos were all natives. No Spaniards were allowed to live in these mission villages except the friars, who exercised there the firm but ordinarily gentle sway of the parent or schoolmaster. In the few Spanish towns there existed the ordinary municipal organizations that prevailed in Spanish America. There was the town corporation 'el Cabildo' (chapter), consisting of two alcaldes (justices), eight regidores (aldermen), a registrar, and a constable. The members of the Cabildo held office permanently. Membership could be bought and sold or inherited.

At the head of the ecclesiastical administration stood the Archbishop of Manila, the Bishops of Cebú, Segovia, and Cáceres, and the Provincials of the four great Orders of friars (the Dominicans, Augustinians, Franciscans, and barefooted Franciscans), and of the Jesuits. The members of these Orders (the regular clergy) greatly preponderated in numbers and influence over the secular clergy, who were mostly natives.

The economic development of the islands was rendered impossible by the manufacturers in Spain, who demanded protection against Asiatic competition in the markets of Mexico and Peru, and secured the restriction of the imports from the Philippines to the cargo of an annual ship. Under this handicap the islands never were a self-supporting, much less an income-yielding, dependency. They were always a burden upon the treasury of New Spain. Their principal trade was with China and was in the hands of the Chinese. The vast majority of the pueblos were simple self-supporting communities of farmers and small artisans.

Secluded from the outside world, the domestic history of the Philippines is distinctively parochial in its character. There is little progressive political or economic evolution from generation to generation. Progress is manifested by the extension of the missions and the amelioration of the life of the natives. Much of the internal history is made up of the various conflicts between the clergy and the political administration or between the Archbishop and the friars. The chief incidents in external history are the volcanic eruptions, the incursions of the Chinese or Moro pirates, the attacks of the Dutch, etc. The events of the great Seven Years' War rudely interrupted this placid life. Spain, drawn into the maelstrom of this conflict in the vain hope of recovering Gibraltar, lost the Floridas and saw Havana and Manila fall before English fleets. The preliminaries of peace, however, had been agreed upon before the news reached England of the capture of Manila, and the conquest was therefore relinquished to Spain. The reforming Government of Charles III. exerted its activities even to the remote Philippines. The Royal Philippine Company was chartered to carry on direct trade between Spain and the islands (1785). Three years earlier the enterprising Governor-General Basco y Vargas, to make the colony self-supporting, introduced the Government tobacco monopoly (1782), by which lands suitable for growing tobacco were arbitrarily pressed into that service and the cultivators compelled by forced labor to produce stipulated amounts to be sold to the Government at fixed prices. This system of compulsory labor was practically the first attempt really to exploit the resources of the islands, and during the following century was fruitful in abuses and of the seeds of revolt. It was abolished in 1882. In this connection should be mentioned the *polos y servicios*, forty days' required labor on the roads, bridges, public buildings, etc., which was exacted of the natives in addition to their tribute. These requirements for public service could be canceled for from one to three dollars. The official class men were exempt from this burden.

The Mexican Revolution severed the ancient connection of New Spain with the 'Western Islands,' and the Spanish Constitution of 1812, which embodied the principles of the French Revolution, and which put all parts of the Spanish Empire on an equality and admitted the Philippines to representation in the Cortes, led the natives to believe that now they would be exempt from tribute and *polos y servicios*. Consequently, when the news came that Ferdinand VII. in 1814 had abolished the Constitution of 1812, the Ilocanos rose in rebellion. Henceforward the agitations of home politics and the example of the Spanish-American States steadily undermined the old-time stability of conditions in the Philippines. The mission system could not be maintained in its integrity. The number of Spaniards in the islands increased, the spirit of colonial exploitation grew, the monastic Orders which combined the functions of landlords and spiritual guides were more and more pervaded with the mercantile spirit. Nor did their predominant influence in the government of the islands at all diminish in an age progressively hostile to clerical control. The opening of the Suez Canal brought the Philippines relatively near to Europe and more than ever exposed them to the contending forces of modern thought. Promising young Filipinos completed their education in Europe. By a few weeks' voyage they found themselves in many respects transported from the sixteenth century to the nineteenth. That they should contentedly return to the earlier age was impossible. The Spaniards did not weather the transition. The final collapse began with the insurrection of 1896, which was primarily an agrarian revolt aimed at the expulsion of the Orders from their estates and the islands.

It seems to be agreed that the establishment of Masonic lodges in the islands and the admission to them later of prominent Filipinos and Mestizos of anti-clerical or liberal sentiments offered a nucleus for agitation, facilitated united action, and led immediately to the formation of the patriotic Asociación Hispano-Filipina, the Liga Filipina, and the revolutionary society, "el Katipunan." The first Masonic lodges were founded about 1860, but it was over a quarter of a century before they became active centres of anti-clerical agitation. The Asociación Hispano-Filipina was devoted to promoting Filipino national aspirations through literary channels, and established an organ, *La Solidaridad*, in Barcelona.

The Liga Filipina was founded by Dr. José Rizal (q.v.) to work for the expulsion of the friars and to secure the same political concessions for the islands that had been granted to Cuba, a larger recognition of the natives in the appointments to civil offices, and freedom of the press and of association. More radical than these was the Katipunan, which was established in 1892 to secure independence by open revolt, and began by wholesale assassinations of Spanish officials and friars. The existence of an elaborate plot was revealed by a native, August 19, 1896, and on the 25th the mask was entirely thrown off. The garrison of Manila consisted of only 300 Spanish regulars and about 1200 native soldiers. The total number of Spanish soldiers in the islands was under 2000. The authorities could act only on the defensive until October, when reinforcements began to arrive from Spain. On the other hand, the insurrectionists were hampered by a great lack of arms and ammunition. The insurrection centred in the province of Cavité, which was under the control of the rebels until their power was broken in the spring of 1897 by the vigorous campaign of General Lachambre. Its leaders were Andrés Bonifacio, the head of the Katipunan, and Emilio Aguinaldo (q.v.).

After organized resistance had been shattered, it seemed wise to the Governor-General, Primo de Rivera, to attempt to secure peace by obtaining the withdrawal of the native leaders from the islands. In accordance with the Treaty of Biacnabató, Aguinaldo and some of the other generals withdrew to Hong Kong. No properly authenticated text of this treaty has ever been published. That made public by Aguinaldo is substantially identical with the demands which he made, and which it would appear were not acceded to by Primo de Rivera. Aguinaldo demanded $3,000,000, the expulsion of the friars, the representation of the Philippines in the Cortes, equality of Filipino and Spaniard in the administration of justice, the participation of Filipinos in the higher administrative offices, a readjustment of the property of the parishes and of the taxes in favor of the natives, the proclamation of the individual rights of the natives, and liberty of association and of the press. Aguinaldo has asserted that the suppression of the religious Orders and the establishment of administrative autonomy were agreed upon, although not put down in writing, Governor-General Primo de Rivera giving his word of honor that the agreement would be fulfilled. Primo de Rivera, on the other hand, maintained that nothing but money and personal security were promised to the leaders. The treaty was signed December 17, 1897. Only the first instalment (£400,000) of the sum of $800,000 finally fixed was ever paid, and, on the other hand, the insurrection was quieted only temporarily. In March, 1898, a new rising in the provinces north of Manila took place and early in April there was an outbreak in the island of Cebú. On March 24th the Seventy-fourth Regiment of native soldiers deserted to the insurgents, who now vastly outnumbered the Spanish forces, but were greatly hampered by the lack of arms.

The day that war began between Spain and the United States, Aguinaldo appeared in Singapore, and on April 24, 1898, United States Consul-General Pratt had a conference with him in reference to coöperating with Commodore Dewey. Of the exact nature of the understanding the same uncertainty exists as in the case of the Treaty of Biacnabató. What is certain is that Commodore Dewey arranged for Aguinaldo to follow him to Manila and that Aguinaldo expected the United States to pursue in the Philippines the policy proposed for Cuba, the policy of common action with the insurgents against Spain for their liberation from her rule. What is probable is that Consul Pratt at Singapore, and Consul Wildman at Hong Kong, and Commodore Dewey as well, had similar expectations. Later they all equally disclaimed having bound the United States in any way. On May 1st the Spanish fleet in the Bay of Manila was annihilated by the Asiatic Squadron under Commodore Dewey. Aguinaldo arrived at Cavité on May 19th, in the American dispatch boat *McCulloch*. He had an interview with Dewey, who supplied him with arms for the insurgents, who flocked to his standard. In the weeks that elapsed until the arrival of General Merritt late in July, Aguinaldo secured control of the Province of Cavité and thoroughly invested Manila by land. His capture of Spanish garrisons was not only sanctioned, but assisted by Dewey, and had it not been for the native forces the capture of Manila would have been a far more arduous undertaking for the Americans and the Spanish forces might have eluded them by retiring into the interior. As it was, the condition of the Spaniards was hopeless, and on August 11th the arrangement was effected, through the Belgian Consul André, by which the American ships should refrain from firing on the walled city of Manila and the Manila forts from firing on the ships, while on shore there should be only a brief show of resistance to enable the Spanish general to save honor at least. The American soldiers were in ignorance of this arrangement, and through an accident there was more bloodshed than was intended at the taking of the city (August 13th). To the onlooking foreigners in the harbor the transaction seemed like a travesty of war. The fall of Manila marked the complete collapse of the Spanish power in the islands. The Americans held the capital and controlled the harbor; and Aguinaldo and the insurgents rapidly extended their control over the various provinces.

In the meantime (almost exactly coincident with the capture of Manila) came the signing at Washington of the peace protocol (August 12th), providing that the United States should occupy and hold the city, bay, and harbor of Manila, pending the conclusion of a treaty of peace, which should determine the control, disposition, and government of the Philippines. On October 31st, after the Peace Commission had been at work in Paris for a month, the Spanish plenipotentiaries were painfully surprised by a demand for the cession of the whole group. It was nearly a month before Spain yielded to the inevitable. In the treaty as signed December 10, 1898, Spain ceded the whole group and the United States agreed to pay Spain $20,000,000, give Spanish ships and merchandise admission to the islands on the same terms accorded to American ships and goods for a period of ten years, and to transport to Spain the Spanish soldiers captured at the surrender of Manila. The treaty was submitted to the Senate of the United States January 4, 1899, and it was ratified February 6th, by only three votes more than the necessary two-thirds majority (57 to 27).

In the meantime, before the protocol of peace, Aguinaldo had organized a government (June 12, 1898), and in the provisional constitution promulgated June 23d he announced the independence of the islands as the chief object of the Revolutionary Government. On August 6th Aguinaldo appealed to the powers of the world for recognition of his forces as belligerents and of the independence of the Philippines, asserting that the Revolutionary Government was predominant in fifteen provinces. These provinces comprised the central part of Luzon and the majority of the inhabitants. During the following months the Americans held Manila and the native forces the rest of the island. The hopes of independence under American protection, which had been based upon the declared attitude of the United States toward Cuba and the friendly cooperation of Admiral Dewey and General Anderson, were rudely shaken by the proposed annexation of the islands to the United States, and relations became greatly strained in consequence of President McKinley's proclamation of December 21st that the islands were ceded to the United States and that military rule was to be extended over them as rapidly as possible. The tension proved too great to last, and on the night of February 4, 1899, hostilities broke out at Manila. The news of this battle, reported as an attack by the Filipinos on the Americans, no doubt contributed to the ratification of the peace treaty two days later.

The first intimations that the islands might be annexed called forth opposition in the United States, which was increased by the open declaration of that policy by the Government and greatly intensified by the outbreak of war between the American army and the Filipino republic. This opposition characterized the acquisition of the islands as the beginning of imperialism, as at variance with the traditional policy of the United States toward peoples struggling for independence, as being identical in its purposes with the projects of Napoleon III. in Mexico, as irreconcilable with the principles of the Declaration of Independence and the spirit of the Constitution, and as inevitably involving unknown expense and bloodshed. It was urged that our policy should have been one of conciliation and substantially identical with that pursued in Cuba, that the Filipinos were as capable of self-government as the South Americans, in whose behalf the Monroe Doctrine was first promulgated, or as the adherents of Juarez in Mexico, who were supported by the United States against Maximilian, and that a protectorate by the United States would have been acceptable to the Filipinos. On the other side, the acquisition of the islands by the United States was declared the only possible solution that would save them from anarchy or from falling into the hands of some European power, and that it was the duty of the United States to accept the burden. Others felt strongly the appeal of the great natural resources of the archipelago, almost undeveloped by Spain, and the immense strategic importance of holding them in view of the future Eastern Asiatic questions.

The discussion of the points of view and the policy of the Government were hampered by great lack of knowledge of the situation. To meet in part this difficulty, President McKinley appointed, in January, 1899, a commission, consisting of President Schurman of Cornell University, Admiral Dewey, Gen. E. S. Otis, the Hon. Charles Denby, and Prof. D. C. Worcester, to investigate conditions in the islands and to labor for the acceptance of American rule by the natives. In March, 1899, the Commission began its work. On April 5th it issued a proclamation to the people of the islands, explaining the purpose of their mission and the intentions of the American Government. The efforts of the Commission were devoted particularly to conciliating prominent Filipinos, and to building up a party favorable to American rule. To do this concurrently with the vigorous prosecution of the war was uphill work. In May they had a conference with some representatives of Aguinaldo, but it came to nothing.

The operations of the American army disorganized the republic and the national movement became embodied in the leadership of Aguinaldo. During the first nine months of the war disappointingly little headway was made by the Americans. The great majority of the engagements were within a radius of fifty miles of Manila. The military authorities exercised a rigid censorship over the press dispatches, so that it was practically impossible for the general public to know the real conditions. In the fall and winter of 1899 there was greater progress. Most of the country, from Manila to Dagupan, came under American control, and the native army was driven to the mountains. The principal events in 1900 and 1901 were in connection with the process of establishing civil government in the islands for which see above under *Government*.

On March 23, 1901, Aguinaldo was captured, and on July 4th military government was superseded by civil government in the pacified districts. By act of Congress, approved July 1, 1902, civil government was established throughout the islands. Up to the establishment of civil rule in July, 1902, the total number of troops sent to the islands amounted to 4135 officers and 123,903 men. The cost of the war to the United States was over $170,000,000.

BIBLIOGRAPHY. The numerous works on the Philippines fall naturally into two groups, those describing the condition of the islands under Spanish rule, and those dealing with the new order of things brought about by American supremacy. To the first group belong the following: Mallat, *Les Philippines* (Paris, 1846), perhaps the best single work; Jagor, *Reisen in den Philippinen* (Berlin, 1873); Sansianco, *El proceso de Filipinos, Estudios economicos, administrativos y politicos, Parte economica* (Madrid, 1881); Jordana y Morera, *Bosquejo geografico e historico-natural del archipielago filipino* (ib., 1885); Montero y Vidal, *El archipielago filipino y las islas Marianas, Carolinas y Palaos* (ib., 1886); id., *Historia general de Filipinas* (Madrid, 1887-1895), perhaps the best general history; Meyer and Schadenberg, *Die Philippinen* (Dresden, 1890-1892); Zuñiga, *Estadismo de las islas Filipinas*, ed. by Retana (Madrid, 1893), which has a bibliography; Sastrón, *Colonizacion de Filipinas* (Malabón, 1897). The second group includes: Foreman, *The Philippine Islands* (2d ed., London, 1899), which gives an immense amount of information, and is the basis of several other works; Youngbusband, *The Philippines and Round About* (New York, 1899), a general résumé of the history and political conditions; Lala, *The Philippine Islands*

(New York, 1899), which gives the point of view of a progressive Filipino; Sawyer, *The Inhabitants of the Philippines* (London, 1900), a historical study of the elements that make up the population of the islands; Buel, Wright, etc., *Our Late Wars: Spain and Our New Possessions* (Washington, 1900); Robinson, *The Philippines: The War and the People* (New York, 1901); Schurman, *Philippine Affairs: A Retrospect and an Outlook* (New York, 1902), an account of the proceedings of the first American Commission; *U. S. Philippine Commission, Report to the President* (4 vols., Washington, 1900-1901); Blair and Robertson, *Philippine Islands, 1493-1803*, an exhaustive work on the early history, compiled from original documents, to be in 55 vols. (Cleveland, Ohio, 1903 et seq). On special periods of the history, consult for conquest and first half century, A. de Morga, *The Philippine Islands*, trans., Hakluyt Society (London, 1868); for the eighteenth century, Le Gentil, *Voyage dans les mers de l'Inde* (Paris, 1781). For the first half of the nineteenth century, Comyn, *Memoria sobre el estado de Filipinas* (Madrid, 1820; Manila, 1877; trans. by Walton, London, 1821); Sinibaldo de Mas, *Informe sobre el Estado de las Islas Filipinas en 1842* (Madrid, 1842); Buzeta and Bravo, *Diccionario geográfico, estadístico, histórico de las Islas Filipinas* (Madrid, 1850); Bowring, *A Visit to the Philippine Islands* (London, 1859). The novels of José Rizal, the Filipino patriot, illustrate the social conditions prior to 1896. *Voli me Tangere* (Berlin, 1856) appears in English somewhat condensed in two editions— *An Eagle Flight* (New York, 1901), and *Friars and Filipinos*, trans. by Gannett (New York, 1902). It was translated into French as *Au pays des Moines* (Paris, 1899). Other works on miscellaneous subjects are: Semper, *Reisen im Archipel der Philippinen* (Leipzig, 1868-1901); Blumentritt, "Versuch einer Ethnographie der Philippinen," in *Petermanns Mitteilungen, Ergänzungsheft* 67 (Gotha, 1882); Worcester, *The Philippine Islands and Their People* (New York, 1898); Stevens, *Yesterdays in the Philippines* (London 1899); Tornow, "The Economic Condition of the Philippines," in *National Geographic Magazine*, vol. x. (Washington, 1899); Morris, *Our Island Empire* (Philadelphia, 1899); Millet, *The Expedition to the Philippines* (New York, 1899); Sonnichsen, *Ten Months a Captive Among Filipinos* (New York, 1901); and for bibliography, Josephson, "Bibliographies of the Philippine Islands," *Bulletin of Bibliography*, vol. ii. (Boston, 1899). For the ethnology, consult: Blumentritt, "List of the Native Tribes of the Philippines, etc.," in *Smithsonian Report* (Washington, 1901); Meyer, "Die Philippinen," in *Ethnographisches Museum*, vol. viii. (Dresden, 1890); Brinton, "The Peoples of the Philippines," *American Anthropologist*, vol. xi. (New York, 1898), which has a bibliography; Meyer and Schadenburg, *Album von Philippinen-Typen* (Dresden, 1891); id., "Die Philippinen," and id., "Negritos," *Königlich-Ethnographisches Museum zu Dresden* (Dresden, 1893).

PHILIPPINE LANGUAGES. The number of languages spoken in the Philippine Islands is variously estimated as from about 25 to over 50. These languages may be considered under two heads: (1) the languages of the Negritos, probably the remnants of the aboriginal population, who live in scattered tribes in the interior of most of the large islands; (2) the languages of the various tribes of Malay race which constitute the bulk of the population (Christian, Mohammedan, and pagan).

About the idioms of the Negritos very little is known, but they are apparently similar to the Malay dialects. This similarity, however, is perhaps to be explained as due to the influence of the languages of the surrounding Malay tribes, especially as, according to Spanish authorities, the Negrito languages are of monosyllabic structure, and entirely different from the languages of the Malays.

The idioms of the Malay tribes form a closely connected group of tongues which constitute a branch of the Malayo-Polynesian family of speech. The principal languages of the Christian tribes are: Batan (Batan and Babuyan islands, north of Luzon), Ibanag (North Luzon), Ilocan (Northwest Luzon), Pampango (Central Luzon), Pangasinan (West Luzon), Tino (language of the Zambals, West Luzon), Tagalog (Manila, Middle Luzon, coast of Mindoro), Bikol (South Luzon), Bisayan (spoken in various dialects in the Bisayan Islands, and North and East Mindanao). The principal languages of the Mohammedan tribes are the Sulu of the Sulu subarchipelago and the coasts of Palawan, and the Magindanao of Southwest Mindanao. The idioms of the pagan tribes which inhabit the mountain districts of Northern Luzon, a large part of Mindanao, and the interior of Mindoro, Palawan, and the western Bisayan Islands, are very numerous, but little known. Among the best known are the Gaddan and Isinay of Luzon, and the Tiruray and Bagobo of Mindanao. A number of the Philippine languages, such as Tagalog and Bisayan, have reached a high state of development, and are well suited for literary use.

The vocabularies of the Philippine languages contain several foreign elements. In common with other languages of the Malay branch of the Malayo-Polynesian family, many of the Philippine dialects have borrowed a number of Sanskrit words. The languages of the Christian tribes also contain a number of Spanish words, those of the Mohammedan tribes a number of Arabic words.

The alphabets in which the native languages were or are written are also due to these foreign influences. The native alphabets, which are no longer used except by the Mangians of Mindoro and the Taghanuas of Palawan, were probably derived from India. The Mohammedan tribes of the south now use the Arabic alphabet with some additional signs, while the languages of the Christian tribes are written in the Roman alphabet conformed to the peculiarities of Spanish orthography.

The sounds of the Philippine languages are in the main similar to those of English. All the languages, however, possess a peculiar guttural-nasal sound (written *ng̃*) distinct from the ordinary guttural-nasal *ng* as in Eng. *sing*. In some of the languages, as in Tagalog and Bisayan, there is a peculiar *r*-sound, due to a phonetic modification of *d*.

The roots of these languages are for the most part dissyllabic. They may be used uncombined as nouns or adverbs, but only rarely as verbs. Derivation is accomplished by means of a great variety of particles, which are usually employed as prefixes, though there are a few suffixes and infixes. So prominent a characteristic is this use

of particles, that these dialects are sometimes spoken of as 'Particular' languages. Reduplication is very common in the formative processes of both noun and verb. There is no distinction of gender, nor is there, generally speaking, any inflection to denote person, number, or case in verbs or nouns. Only in certain pronouns is there found a species of inflection to indicate case. Verbs are practically always derivative, the particles employed being of two kinds: (1) special verbal particles, which give the root a simple verbal meaning or the signification of causative, intensive, etc., each particle generally having two slightly different forms, one used with active and the other with passive verbs; (2) the common or essential passive particles, which are an essential part of practically all passive forms. The combination of root and verbal particle is often modified to indicate differences in mood and tense.

The most salient syntactical characteristics of these languages are: (1) the use of certain particles, so-called ligatures, to connect two or more words which stand to each other in the relation of modifier and modified; such as adjective and noun, noun or pronoun and appositive, adjective or verb and adverb; (2) the prevailing use of a passive construction, the verb standing in the active only when the object of the action is something indefinite or when the agent is specially emphasized; (3) a paucity of simple prepositions, one or two being used to express the greatest variety of relations.

The following is a brief grammatical sketch of Tagalog, the most important of the Philippine languages:

The articles are simply definite, personal, and inclusive (used with names of persons), as *ang táwo*, 'the man,' *si Pedro*, 'Peter,' *sinà Pedro*, 'Peter and his companions.' They have three case forms, nominative, genitive, and oblique. The plural of nouns is expressed by preceding *manǧá*, e.g. *manǧá táwo*, 'men;' case, by the case forms of the article or pronominal adjectives.

Adjectives are usually made by prefixing *ma* to a root, as *ma-bùti*, 'good;' plural *mabubùti or manǧá mabùti*.

The pronouns have usually three case forms. Among them are to be noted *tayo*, 'we (including you),' *kami*, 'we (not you),' *kita*, 'we two.'

The ideas of 'being' and 'having' are expressed by independent particles.

Verbs are divided into seventeen classes according to the special verbal particles. Four stems are distinguished, imperative-infinitive, future, preterite, and present. One class has no special particle in the passive, the active particle being *um;* in the others the special particle has generally initial *p* in the passive, which becomes *m* in the imperative-infinitive and future active, and *n* in the preterite and present active, as *pad, nag, nag*, etc. The present and future are characterized by reduplication. The common passive particles are *in, i, an*.

Practically the only simple prepositions are *sa* and, with names of persons, *kay* and *kanì*, 'to,' 'for,' 'from,' 'in,' etc. Adverbs and conjunctions are numerous and important.

The ligatures are, *-ng* after a vowel or *n*, *na* after other consonants, as *ang malakas na táwo*, 'the strong man,' *lubhà-ng mabùti*, 'very good.'

The construction of verbs is very similar to that of nouns. When the subject precedes, it is connected with its verb by the particle *ay*, 'to be.' The direct object of the active and the agent of the passive stand in the genitive, other nominal adjuncts in the oblique case. Any verbal form may take the article *ang*. The character of the subject determines the verbal form to be used in a sentence. In general, if the subject is the agent of an action, the verb stands in the active, otherwise in the passive. The *in*-passive is used in general when the subject is the object of an action, the *i*-passive when it is the object of an action away from the agent, or the cause of an action, the *an*-passive when it is the place of an action.

The Philippine languages possess little literature. The old native manuscripts inscribed on leaves or strips of cane have been lost. At the present day the scanty native literature may be grouped under three heads: (1) religious writings; (2) native poetry; (3) native newspapers and newspaper articles.

Consult: Totanes, *Arte de la lengua Tagala* (2d ed., Binondo, 1865); Campomanes, *Lecciones de gramatica Hispano-Tagala* (5th ed., Manila, 1894); Noceda, *Vocabulario de la lengua Tagala* (2d ed., ib., 1860); Zuñeo, *Metodo del Dr. Ollendorff . . . adaptado al Bisaya* (ib., 1871); Bermejo, *Arte compendiado de la lengua Cebuana* (Bisayan) (2d ed., Tambobong, 1894); Lozano, *Cursos de lengua Panayana* (Bisayan) (Manila, 1876); Mentrida-Aparicio, *Arte de la lengua Bisaya-Hiligayna* (Tambobong, 1894); Figueroa, *Arte del idioma Visaya de Samar y Leite* (2d ed., Binondo, 1872); Encarnacion, *Diccionario Bisaya-Español* (3d ed., Manila, 1885); Naves, *Gramatica Hispano-Ilocana* (2d ed., Tambobong, 1892); Agustín, *Vocabulario Iloco-Español* (2d ed., Manila, 1888); De Cuevas, *Arte nueva de la lengua Ybanag* (2d ed., ib., 1854); Bugarín, *Diccionario Ibanag-Español* (ib., 1854); Bergaño, *Arte de la lengua Pampanga* (2d ed., Sampaloc, 1736); id., *Vocabulario de la lengua Pampanga* (2d ed., Manila, 1860); Pelliser, *Arte de la lengua Pangasinana* (2d ed., ib., 1862); Cosgaya, *Diccionario Pangasinán-Español* (ib., 1865); San Agustín-Crespo, *Arte de la lengua Bicol* (ib., 1879); Cowie, *English-Sulu-Malay Vocabulary* (London, 1863); Juanmartí, *Gramatica de la lengua de Mindanao* (Manila, 1892); id., *Diccionario Moro-Maguindanao-Español* (ib., 1892).

PHILIPPONS. A Russian sect, a branch of the Raskolniki (q.v.), who emigrated to Lithuania and East Prussia at the beginning of the eighteenth century. They take their name from their leader, Philip Pustosviät. They are described as peaceable and orderly, skilled in agriculture, thrifty, and industrious. They refuse to take oaths or perform military service, and set a high value upon suffering and death for conscience' sake. Priestly duties, such as leading in worship, baptism, and absolution, are performed by the oldest of the community. They do not observe the Lord's Supper, and have no confirmation or religious marriage ceremony. Their religious services consist in singing psalms, and reading the Gospels.

PHILIPPOP'OLIS (Bulg. *Plovdiv*, Turk. *Filibeh*). The largest city of Bulgaria next to Sofia, and formerly the capital of Eastern Rumelia. It is situated in a wide, fertile plain at the head of navigation on the Maritza

River, on the railroad between Constantinople and Sofia, and 80 miles southeast of the latter city (Maps: Balkan Peninsula, E 3). Most of the houses are of wood, but the city has in recent years been much enlarged and beautified by the laying out of new streets and public parks, such as the beautiful Exhibition Park, laid out in 1892, and the growing up of fine residential suburbs containing the villas of wealthy Greeks and Bulgarians. The city is the seat of a Greek archbishop, and has a new Greek cathedral, besides a number of other Christian churches and many mosques. There are also a college and a national library. Philippopolis is the chief commercial centre of Southern Bulgaria, and has an active trade in the products of its manufactures, such as silk and cotton fabrics and attar of roses, as well as in rice, grain, tobacco, and hides. Population, in 1888, 33,032; in 1900, 42,849, of whom nearly half are Bulgarians, the remainder being mostly Turks and Greeks. Philippopolis was an important Thracian city in ancient times. It was almost wholly destroyed by an earthquake in 1818, and again by fire in 1846; but it recovered rapidly, owing to its excellent trade facilities.

PHILIPPOTEAUX, fē'lē'pō'tō', Félix (1815-84). A French battle painter. He was born in Paris, and was a pupil of Léon Cogniet. His thorough knowledge of military details enabled him to depict the turmoil of battle with great historical truth, as may be judged by the following more important productions from his brush: "Louis XV. Inspecting the Battlefield of Fontenoy" (1840, Luxembourg Museum); "Battle of Balaklava" (1859); and some in the Museum at Versailles, such as the "Battle of Rivoli" (1844); "Bayard on the Bridge of Tarigliano" (1563); "Battle on the Alma" (1875). His "Last Banquet of the Girondists" (1850, Marseilles Museum) is also worthy of notice. He is well known as a painter of panoramas, in which he made great improvements. (See Panorama.) He received a medal of the first class in 1840 and the cross of the Legion of Honor in 1846.

PHILIPPSBURG, fil'ips-bûrk. A town in the Grand Duchy of Baden, situated near the Rhine, about 17 miles north of Karlsruhe. It was once a noted fortress originally founded by the bishops of Speyer at the beginning of the seventeenth century. It played a conspicuous part in the wars of the seventeenth century, and the fortifications were destroyed in 1800. Population, in 1900, 2546.

PHILIPPSON, fil'ip-zŏn, Martin (1846—). A German historian, born at Magdeburg. He studied at Bonn and Berlin, became docent at Bonn in 1871, and in 1878 professor in the University of Brussels. From this post he resigned in 1890 after a sharp quarrel with the anti-German student body, and removed to Berlin. Philippson wrote: *Geschichte Heinrichs des Zweiten* (1874); *Heinrich IV. und Philipp III.* (1874-76); *Geschichte des preussischen Staatswesens vom Tode Friedrichs des Grossen bis zu den Freiheitskriegen* (1880-82); *Kurfürst Friedrich Wilhelm von Brandenburg* (1879-1901); *Kulturgeschichte Europas seit dem Untergange des Mittelalters* (1898); and *Das Leben Kaiser Friedrich III.* (1900).

PHIL'IPS, Ambrose (1675?-1749). An English poet, born in Shropshire, probably in 1675. He graduated from Saint John's College, Cambridge, B.A. in 1696, M.A. in 1700, and was elected fellow of his college, but he resigned his fellowship (1708) and traveled on the Continent. From Copenhagen he addressed (March 9, 1709) an *Epistle to the Earl of Dorset*, which was published in the *Tatler* (No. 12) with warm praise by Steele. The same year appeared his pastorals in Tonson's *Miscellany*, along with Pope's *Pastorals*. Then ensued a controversy as to which poet had better succeeded. Both series are artificial. Philips was angered by a mock commendation of his pastorals which Pope contributed to the *Guardian* (No. 40), and he is said to have hung up a rod at Button's coffee-house for ehastising his adversary. No encounter ever took place. Philips was, however, remembered in the *Dunciad*. In ridicule of Philips, Gay wrote the *Shepherd's Week* (1714), descriptive of rustic life with the gilt off. In 1712 Philips was lauded for his adaptation of Racine's *Andromaque*. In 1718-19 he edited an imitation of the *Spectator* called the *Freethinker*. His support of the Government led to his appointment as secretary to Bishop Boulter in Ireland (1724). He also represented Armagh in the Irish Parliament; was made secretary to the Lord Chancellor (1726), and judge of the Prerogative Court (1733). He died in London, June 18, 1749. Philips also translated the odes of Sappho (1713), once thought to be a brilliant achievement. Perhaps his best work is represented by his odes to children (1725-26). Consult: Pope's *Works*, ed. by Elwin and Courthope (10 vols., London, 1871-89); and Johnson's *Lives of the Poets*, ed. by Henley (London, 1896).

PHILIPS, Francis Charles (1849—). An English novelist and playwright. He was born at Brighton and educated for the army, but he left army life and in 1884 became a barrister. At that time he began, without ceasing to be a barrister, to write both plays and novels. Of the latter the most noted is *As In a Looking Glass* (1885), which was dramatized and played both by Mrs. Bernard Beere and by Sarah Bernhardt. Among his other books are: *A Lucky Young Woman* (1886); *The Dean and His Daughter* (1887), on which was founded the play of *The Dean's Daughter*, by himself and Sydney Grundy; *Young Mrs. Annesley's Courtship* (1890); *Mrs. Bouverie* (1894); *The Luckiest of Three* (1896); *Men, Women, and Things* (1898), etc. With various collaborators, he is the joint author of the plays *Husband and Wife*, *A Woman's Reason*, *Papa's Wife*, and others.

PHILIPS, or **PHILLIPS**, John (1676-1709). An English poet, born at Bampton, Oxfordshire, December 30, 1676, and educated at Winchester School and at Christ Church, Oxford. He died at Hereford, February 15, 1709. Philips is still known for two poems: the *Splendid Shilling*, a burlesque (1701), and *Cyder* (1708), on the plan of Vergil's *Georgics*. The first was translated into Latin, and the second into Italian. As a Tory reply to Addison's *Campaign*, Philips wrote *Blenheim* (1705). Philips was among the few poets between Milton and Thomson to cultivate blank verse. Consult Johnson's *Poets*, ed. by Henley (London, 1896).

PHILIPS, Katherine (1631-64). An English poet, better known by her literary nickname, 'the Matchless Orinda.' She was born in London,

the daughter of John Fowler, a well-to-do merchant. In 1647 she married a Welshman, Hector Philips, son of her mother's second husband; four years afterwards she addressed Henry Vaughan in what seems her first poem; and she soon formed that literary and friendly circle which included Jeremy Taylor and Sir Charles Cotterel, and in which she took the name Orinda. She spent the year 1662 in Dublin and there made many friends among the Royalist Party, with which she had sentimentally allied herself, and translated Corneille's *Pompée* with great success. *Horace* she did not live to complete, for she died of smallpox in her thirty-third year. Her poems, printed without authorization in 1663, were highly praised by her contemporaries. Her *Letters to Poliarchus* (Sir Charles Cotterel) were published in 1705. Consult Gosse, *Seventeenth Century Studies* (London, 1883).

PHILISTINES (Lat. *Philistini*, from Heb. *Pĕlishtī*, Philistine). The designation in the Bible of a people who lived on the coast of the Mediterranean, to the southwest of Judea, from Ekron toward the Egyptian frontier, with their eastern limit at Beth-Shemesh. Aside from a few notices in Assyrian and Egyptian inscriptions, we have no knowledge of the early history of the Philistines, except what may be gathered from the Old Testament, in which their relations to the Hebrews are set forth in the course of the historical narratives. The people called Philistines were immigrants who came into Canaan from Caphtor (probably Crete). They are probably identical with the *Plst* of the Egyptian inscriptions, who invaded Egypt from the north in the time of Rameses III. and, being repelled, settled on the Syrian coast. Their settlement in Western Palestine presents, therefore, a parallel to the Hebrew conquest of Canaan. In both cases the new comers dispossessed an older population, and adopted the language and to a large extent the customs of the conquered race. But, while the Hebrews and Canaanites belonged to the same Semitic stock, the Philistines are aliens in a racial sense. At the time of the Hebrew conquests, they were already in Palestine, and their five central cities, Ashdod, Gaza, Ashkelon, Gath, and Ekron, around which their history, as far as we know it, centres, were presumably already in existence. Hebrew tradition contains a reminiscence of an unsuccessful attempt to drive the Philistines out of their settlements (Jud. i. 18-19).

We reach more certain historical ground in the account of Shamgar's stand against the Philistines (Jud. iii. 31), but evidently the latter retained the supremacy, for we find them subsequently in possession of a sacred palladium of the Hebrews—the chest which was the symbol of Yahweh (I. Sam. iii. 10 sqq.). The story of Samson is of value as showing what were the relations between the Hebrews and Philistines. A victory is signalized for the Hebrews at Mizpah (I. Sam. vii. 10), but if the account is historical, the result was not decisive, for we find that Saul was constantly engaged in warding off their new encroachments, and at Gilboa he and his sons fell in a disastrous battle against them. David, however, though in the early part of his reign obliged to pay tribute to the Philistines, succeeded in routing them in several expeditions. Under Solomon they gave no further trouble, though it is doubtful whether they were ever actually tributary to the Hebrew kingdom. The internal troubles of Judea emboldened the Philistines once more to open resistance. Under Joram they invaded Judea and did considerable damage. Uzziah, however, recovered the lost ground; he overthrew them and dismantled some of their most powerful fortresses—Gath, Jabne, and Ashdod—and erected forts in different parts of their country. Under Ahaz, they rose again, and attacked the border cities of the 'plain' on the south of Judah; and a few years later renewed their attacks, in league with the Syrians and the Assyrians. Hezekiah, in the first years of his reign, subjugated their whole country again, by the aid of the Egyptians, whom we find in possession of five cities. The Assyrians were frequently engaged in conflicts with the Philistines, who at times joined the other Palestinian principalities in opposing the advance of Assyrian arms. In the struggles for supremacy which raged between the Neo-Babylonian monarchy and the Egyptians, Philistia was the constant battle-ground of both—her fortresses being taken and retaken by each of them in turn; so that the country soon sank into ruin and insignificance. In the time of the Maccabees the Philistines were subjects of the Seleucid rulers and had to suffer occasionally from the Jews, although intermarriages between the two nations were of no rare occurrence. Alexander Balas transferred part of the country to Judea; another part was taken by Alexander Jannæus; Pompey incorporated some of the cities with Roman Syria; Augustus transferred another portion to Herod; and, finally, Salome received a small fragment of it as a principality, consisting of Jamnia, Ashdod, and Ashkelon. But by this time the name of the country had long been lost in that of Palestine, which designated all the territory between Lebanon and Egypt.

Of the state of culture, institutions, etc., of the Philistines we know very little. They appear as a civilized, agricultural, commercial, and warlike nation. They traded largely, and their wares seem to have been much sought after. Their worship was much akin to that of the Phœnicians and Canaanites. Dagon, Ashtaroth, Beelzebub, and Derceto were the chief deities.

BIBLIOGRAPHY: Stark, *Gaza und die philistäische Küste* (Jena, 1852); Schwally, "Die Rasse der Philister," in *Zeitschrift für wissenschaftliche Theologie*, vol. xxxiv. (Leipzig, 1891); W. M. Müller, *Asien und Europa* (Leipzig, 1893); id., *Die Philister* (Berlin, 1899); G. A. Smith, *Historical Geography of the Holy Land* (London, 1897); McCurdy, *History, Prophecy, and the Monuments*, vol. i. (New York, 1894).

PHILISTINISM. A term made popular in England and America by Matthew Arnold. The allusion is to the ancient Philistines, the enemies of the children of light; hence Philistinism, in its modern application, means stolid opposition to the higher intelligence of the age, inaccessibility to ideas; plain, humdrum, respectable conventionalism. The German students first applied the term *Philister* to a townsman or to one who had not been trained in a university; it soon found a foothold in German literature, and reached England through Carlyle. The term has now grown hackneyed and its indiscriminate use has almost emptied it of meaning. Perhaps Leslie Stephen's definition of Philistinism, as "a term of contempt applied by prigs to the rest of

[illegible] is to be one that is sufficiently [illegible]-sive. Consult Arnold, "Heine," in *Essays in Criticism*, first series (Oxford, 1865).

PHILIS'TUS (Lat., from Gk. Φίλιστος, c.435-c.356 B.C.). A Greek historian of Syracuse. He assisted the elder Dionysius in securing and maintaining supreme power in Syracuse (c.405 B.C.), but in 386 was banished for marrying a niece of the tyrant without the latter's consent. Recalled soon after the accession of Dionysius the younger, he brought about the banishment of Dion and Plato, and according to the latter, employed his talents in defense of the despotic policy of Dionysius. In B.C. 356, however, he was defeated in a naval battle by Dion and the revolted Syracusans, and either committed suicide or was killed by the populace. He left *Sicelica* (Σικελικά), a history of Sicily from the earliest times to B.C. 362, in thirteen books, begun in exile. According to the testimony of the ancients, by whom he is frequently mentioned, he sought in this work to palliate the despotic deeds of Dionysius, in order to secure his own return from exile. In style he was a close, though unsuccessful, imitator of Thucydides. The few extant fragments of Philistus are edited in C. Müller's *Fragmenta Historicorum Graecorum* (Paris, 1841).

PHILLE'O. PRUDENCE (CRANDALL). See CRANDALL (PHILLEO), PRUDENCE.

PHIL'LIMORE, Sir ROBERT JOSEPH (1810-85). A distinguished English jurist, born in London. He was educated at Westminster and Christ Church, Oxford, where he graduated in 1831, and then became a clerk of the Board of Control. Soon afterwards he was called to the bar, where he acquired a large practice, and was made a Queen's counsel. In 1844 he was made Chancellor of the Duchy of Chichester, and later was a member of Parliament. He was made judge of the Cinque Ports in 1855, advocate-general in admiralty, 1862, when he was knighted, and in 1867 judge of the High Court of Admiralty and of the Arches Court of Canterbury. He was Judge Advocate-General, 1871-73, and made Master of the Faculties in the latter year. In 1875 he resigned his other offices, and was appointed judge of the Admiralty and Probate Division of the High Court of Justice, retiring in 1880. The most valuable of his numerous legal works is his *Commentaries upon International Law*, 4 vols. (3d ed., London, 1879-80). Among his other writings are *Memoirs and Correspondence of George, Lord Lyttelton, 1734-53* (ib., 1845); *The Ecclesiastical Law of the Church of England*, largely taken from the work of Burn upon that subject (2d ed., ib., 1895).

PHILLIMORE, Sir WALTER GEORGE FRANK (1845—). An English jurist, born in London. He was educated at Oxford, where he had a particularly distinguished career, became a barrister of the Middle Temple in 1868, and received the Patent of Precedence there in 1883. He stood high in the Admiralty Court, and in ecclesiastical circles as vice president of the English Church Union, and chancellor of the Diocese of Lincoln. He wrote a *Book of Church Law*, and edited Robert Phillimore's *Ecclesiastical Law of the Church of England*, and a third edition of vol. iv. of that author's *International Law*.

PHIL'LIP, JOHN (1817-67). A Scotch genre and portrait painter. He was born at Aberdeen, April 19, 1817. His boyhood was spent in poverty, but his remarkable talent attracted the attention of Lord Panmure, who enabled him to study at the Royal Academy. He at first painted Scotch genre subjects in the manner of David Wilkie, but a voyage to Spain in the summer of 1851-52, made for the benefit of his delicate health, completely changed his style. Influenced by Valazquez and by the bright colors of nature about him, he adopted the rich coloring by which his best works are distinguished. His work having attracted the attention of Sir Edmund Landseer, who introduced him to the Queen, he received a number of royal commissions, among which was a large ceremonial picture, "The Marriage of the Princess Royal with the Crown Prince of Germany" (1860). He visited Spain in 1856-57 and again in 1860, his last visit being a time of great artistic activity. After a journey to Rome and Florence in 1866, for the purpose of studying Titian, he was stricken with paralysis and died at Kensington (London), February 27, 1867.

Among the best paintings of his early period are: "Wallace and His Schoolfellows at Dundee" (1846); "Presbyterian Catechising" (1847); "Baptism in Scotland" (1850); "Scotch Washing" (1851). After his visit to Spain he executed "The Spanish Gypsy Mother" (1853), the "Letter-Writer of Seville," and the "Dying Contrabandista" (1858), all in the Royal Collection. Other important works are: "A Huff" (1859); the "Prison Window" (1857); "La Bomba" (1862-63); and his masterpiece, "La Gloria" (1864), in the National Gallery of Scotland. In the Metropolitan Museum, New York, is his "Gossips at the Well." He also produced a number of forcible portraits, including those of Sir J. E. Millais (1843), the Prince Consort (1858), and the Princess Beatrice (1860).

PHIL'LIPS. The name of a family identified with the founding of Phillips Academy (q.v.). SAMUEL, JR. (1751-1802), politician and philanthropist, was born at Andover, Mass. He graduated at Harvard in 1771 and was elected in 1775 to the Provincial Congress, of which he continued to be a member until 1780, when he was elected a member of the Massachusetts State Senate, of which for seventeen years (1785-1802) he was presiding officer. From 1781 until 1798 he was also judge of the Court of Common Pleas for Essex County, and in 1801 he was elected Lieutenant-Governor by the Federalists. He is best known, however, as the founder of Phillips Academy at Andover in 1778. In this project he interested his father, SAMUEL (1715-90), who graduated at Harvard in 1734, and afterwards represented Andover in the General Court; his uncles, JOHN (1719-95), who graduated at Harvard in 1735, settled at Exeter and was for many years a member of the Council of New Hampshire, and WILLIAM (1722-1804), who held important political offices in Massachusetts; and the latter's son, WILLIAM, JR. (1750-1827), who was in twelve successive elections chosen Lieutenant-Governor of Massachusetts. Their liberality enabled the academy to take a high position from the day of its opening. A few years later John Phillips, who was childless, founded at Exeter a similar academy, to which at his death he bequeathed two-thirds of his estate, the remaining third going to Phillips Andover. During his lifetime he also endowed a professorship at Dartmouth College, and made liberal gifts to Princeton.

PHILLIPS, ADELAIDE (1833-82). An American opera singer. She was born at Stratford-on-Avon, England, but when she was seven years old her family emigrated to America and settled in Boston. She first appeared at the Boston Museum, in 1843, as "Little Pickle," and played *soubrette* parts in that theatre and at the Walnut Street Theatre, in Philadelphia, until 1852, when, having revealed the possession of a contralto voice of remarkable sweetness and compass, she was sent to Italy for study, an advantage obtained largely through the efforts of Jenny Lind, who organized a subscription for the purpose. She remained abroad two years, and made a successful *début* in Brescia, in 1853, in *Semiramide*. The following year she returned to the United States, and appeared in concert in the Music Hall, Boston, making her American *début* in opera at the Academy of Music, New York, March 17, 1856, in the part of "Azucena" in Verdi's *Il Trovatore*. In 1861 she sang in the Italian Opera House in Paris. She was the leading contralto singer of America for many years. She died at Karlsbad.

PHILLIPS, EDWARD (1630-c.1696). An English compiler, the biographer of his uncle, John Milton. The poet's elder and only sister, Ann, on her second marriage left her two sons by her first to the care of her brother, who took them into his own house in Aldersgate. Edward was at that time ten years old, John a year younger, and besides his nephews, Milton took in other pupils. Edward ceased studying with him in 1646, and two years afterwards went to Oxford, where he departed from his Puritan training and joined himself to the Cavalier Party. Edward voiced his royalist sentiments in *The Mysteries of Love and Eloquence*, etc. (1658), containing verses some of which are not original, and to record the Restoration he wrote a *Continuation* (1665) to Barker's *Chronicle of the Kings of England*, which had stopped at 1641. He edited the poems of Drummond of Hawthornden (1656), compiled a dictionary (1658), and was tutor in more than one noble household, but was often obliged to support himself and his family by compilations and translations. John Philips never became reconciled to his uncle, but Edward did. He was the first to praise *Paradise Lost* in the press, spoke in the highest terms of its author in his *Theatrum Poetarum* (1675), and wrote the scant but appreciative *Life of Milton* prefixed to the *Letters of State* (1694).

PHILLIPS, HENRY (1838-95). An American archæologist, born in Philadelphia. He was admitted to the bar in that city in 1859, but, because of ill health, devoted himself to the study of numismatics, philology, and archæology. His publications include *History of American Colonial Paper Currency* (1865); *History of American Continental Paper Money* (1866); *Pleasures of Numismatic Science* (1867); a volume of Spanish and German poetry (1878); Chamisso's *Faust* (1881); and four volumes from the Hungarian, German, and Spanish (1884-87).

PHILLIPS, JOHN (1800-74). An English geologist, born in Wiltshire. After receiving an elementary education he joined his uncle, William Smith, in geological investigations in various parts of England. In 1825 he was made curator of the Yorkshire Philosophical Society, and in 1834 was appointed professor of geology at King's College, London. Resigning this office in 1840, he served successively as geologist on the survey of Great Britain, professor of geology at Trinity College, Dublin, and at Oxford, and Keeper of the Ashmolean Museum. He was president of the Geological Society in 1859-60. He contributed numerous papers to scientific journals, and also wrote the following separate works: *Illustrative of the Geology of Yorkshire* (1822-36); *Guide to Geology* (1834); *Treatise on Geology* (1837); *Geological Map of the British Isles* (1842); *Memoirs of William Smith* (1844); *Vesuvius* (1869); and *The Geology of Oxford and the Valley of the Thames* (1871).

PHILLIPS, JOHN ARTHUR (1822-87). An English geologist, born at Polgooth, near St. Austell, Cornwall, and educated at the Paris School of Mines. He was appointed chemist to the Admiralty commission engaged in finding the most suitable coal for burning at sea, and afterwards made valuable researches in mineralogy. He inspected gold mines in California and elsewhere, and between 1875 and 1878 he wrote a series of important monographs on the rocks of his native country. He published *The Mining and Metallurgy of Gold and Silver* (1867), and *The Elements of Metallurgy* (1874), but his chief work was *A Treatise on Ore Deposits* (1884).

PHILLIPS, PHILIP (1834-95). A Methodist evangelist and singer. He was born in Chautauqua County, N. Y. After the age of nineteen he devoted all his time to the study and use of music. During the Civil War he sang much for the benefit of the Christian Commission; he became musical editor for the Methodist Book Concern in 1866; and made a musical tour around the world in 1872, holding evenings of song in all lands. On his return he gave 200 nights for the Sunday School Union in England; subsequently he traveled with D. L. Moody. He produced a number of hymn books, such as *Early Blossoms* (1860); *The Singing Pilgrim* (1866); *American Sacred Songster*, prepared for the British Sunday School Union (1868); *Hallowed Songs* (1871); *Our New Hymnal* (1894); and, with his son, *Bright Gems* (1895). Several of these had a very large sale.

PHILLIPS, STEPHEN (1868—). An English poet, born at Summertown, near Oxford, July 28, 1868, son of the Rev. Stephen Phillips, afterwards precentor of Peterborough Cathedral. Having attended the grammar school at Stratford-on-Avon and at Peterborough, he studied for the civil service and entered Queen's College, Cambridge, in 1886, but at the end of the first term he joined F. R. Benson's company of Shakespearean players, with whom he stayed six years. He traveled through the country and played at the Globe Theatre in London. Among his parts were Iago, the ghost in *Hamlet*, Prospero, Brutus, and Sir Andrew Aguecheek. Leaving the stage, he became a lecturer on English history in Wolfram and Needham's classes for army candidates, but soon he adopted literature as a profession. In June, 1890, with three other authors he published in London a booklet of verse entitled *Primavera*. In 1894 followed *Eremus*, which won the praise of Symonds, Jowett, and Stopford Brooke. *Christ in Hades and Other Poems* (1896; fourth edition with additions, 1897), and *Poems* (1897), containing "Marpessa," secured for the author a high rank among

recent poets. *The Poems* won from the London *Academy* the award of one hundred guineas for the best verse of the year. Commissioned by George Alexander to write a verse tragedy for Saint James's Theatre, Phillips composed *Paolo and Francesca* (1899), a poetic tragedy in four acts. The blank verse of this lyric tragedy recalls the Elizabethans, but its simple structure is more nearly akin to the French classic drama. For Beerbohm Tree Phillips wrote his second play, *Herod* (1900), a tragedy in three acts on an Elizabethan theme. *Ulysses*, a dramatic poem, appeared in 1902, and in the same year a play called *David and Bathsheba*.

PHILLIPS, THOMAS (1770-1845). An English portrait painter, born in Dudley, Warwickshire. He was a pupil of Francis Eginton, a glass painter of Birmingham, and afterwards worked under Benjamin West on the windows of Saint George's Chapel, Windsor. He began to exhibit at the Royal Academy in 1791 and was elected to that institution in 1808. There he succeeded Fuseli as professor of painting and his *Lectures on the History and Principles of Painting* were published in 1833. His portraits include those of the Prince of Wales, William Blake (in the National Portrait Gallery), Napoleon (at Petworth), Lord Byron (two pictures), Crabbe, Lord Brougham, David Wilkie (in the National Gallery), Walter Scott, Hallam, Faraday, and Davy.

PHILLIPS, WENDELL (1811-84). An eminent American orator and reformer, born in Boston. He was educated at Harvard, graduating in 1831—the year of the first appearance of the *Liberator*. After a three-years' course at the Cambridge Law School, he was admitted to the Suffolk County bar; but he was little interested in professional eminence. On October 21, 1835, from his office window he indignantly saw Garrison dragged at a rope's end by a respectable mob; in 1836 he joined the Abolitionists, and thereafter was occasionally heard at meetings of the American Anti-Slavery Society. He came at once into prominence by his Faneuil Hall speech of December 8, 1837. At the instance of Dr. W. E. Channing, a public assembly had convened to protest in a suitable manner against the murder of the Rev. E. P. Lovejoy (q.v.) at Alton, Ill. This purpose seemed likely to be defeated by J. T. Austin, Attorney-General of Massachusetts, who commended the Alton rioters, and affirmed that Lovejoy "died as the fool dieth." To this Phillips made a brilliant and crushing reply, whose eloquence he never surpassed, and which has been ranked by Curtis with Henry's oration at Williamsburg, and Lincoln's Gettysburg address. From that time he was an Anti-Slavery leader, to eminently the orator of the movement. In 1839 he withdrew from the practice of law through scruples against compliance with the attorney's oath to the Constitution, and later he refused to stand for a Congress which he could not enter without swearing allegiance to that same Constitution. He called for the immediate and complete abolition of slavery, declared the Church *particeps criminis* for its attempt to justify slavery by the Scriptures, opposed colonization for the negro, discontinued voting, and advocated disunion as the best means for accomplishing emancipation. He was not to accept Garrison, a non-resistant. In the Abolitionist divisions of 1839-40, he with Garrison opposed the organization of the Abolitionists in a political party, and the attempt to bar any from the anti-slavery platform on the ground of religious beliefs. In 1840 he was the representative of the Massachusetts Abolitionists at the London World's Anti-Slavery Convention. Differences arose between himself and Garrison in 1864, in regard to Lincoln's reëlection, which he did not favor; and in 1865 these differences were renewed when he advocated and Garrison opposed the continuance of the Anti-Slavery Society. His contention was that the work of the society was not finished until the negro obtained the suffrage. As a result he was elected in Garrison's stead (1865) to the presidency of the society, which was dissolved in April, 1870, upon the passing of the Fifteenth Amendment. Phillips was prominently active in the various controversies of the Reconstruction. Yet his task did not end there. "Let it not be said," he once wrote, "that the old Abolitionist stopped with the negro, and was never able to see that the same principles claimed his utmost effort to protect all labor, white and black, and to further the discussion of every claim of humanity." Accordingly, he spoke in behalf of Ireland, Crete, the Indian, prison reform, the abolition of capital punishment, prohibitory legislation regulating the sale of liquor, the 'greenback theory,' and in connection with the labor question urged that vast combinations of capital with unlimited monopolies and powers tend to make the rich richer and the poor poorer. In 1870 he received about 20,000 ballots as labor reform and temperance candidate for the Governorship of Massachusetts.

Phillips must be compared among American orators to Everett, Clay, and Webster; and his achievement is, perhaps, to be reckoned greater than that of any of these, when it is considered that whereas they represented a strong political organization or powerful conservative opinion, he attacked existing prejudices and institutions, for years spoke to hostile audiences, was denounced by the two great parties, and belonged to none. His manner was that of "simple colloquy," so that Greeley said Phillips made one think it easy to be an orator. His voice was in the baritone register, used largely in what elocutionists call the upper chest notes, and remarkable not so much for its compass, volume, or intensity as for its *timbre*. In gesture or general action he was sparing. He seldom employed the dramatic mode of expression. But in invective or epigram he was unsurpassed, he possessed wit, which most other notable American orators have lacked, and he told an anecdote with much skill. Phillips was not a scholar in the restricted sense, for this the demands made upon his time as a public speaker did not permit. But his reading was considerable, and he could always find illustrative material in the one subject he was accustomed to say he knew thoroughly—the great English Revolution. In addition to his anti-slavery and other reform speeches, he appeared in various lyceum addresses, the most noteworthy of which are *The Lost Arts*, *Toussaint l'Ouverture*, and *Daniel O'Connell*, and in 1881 he made a distinguished oration on *The Scholar in a Republic* at the centennial anniversary of the Phi Beta Kappa of Harvard. During anti-slavery days he always offered to speak without remuneration and pay

his expenses if he might substitute an anti-slavery for a literary subject. He wrote for the *Liberator* and the *Anti-Slavery Standard*, and published a number of pamphlets, including *The Constitution a Proslavery Compact* (1844); *Can Abolitionists Vote or Take Office Under the United States Constitution?* (1845); *Review of Spooner's Unconstitutionality of Slavery* (1847); *Review of Webster's Seventh-of-March Speech* (1850); *Review of Kossuth's Course* (1851); *Defense of the Anti-Slavery Movement* (1853). Collections of *Speeches, Lectures* and *Letters* have appeared at Boston, the first series, edited by James Redpath, in 1864, the second by T. C. Pease in 1892. These are edited from the best stenographic reports. There are two inadequate biographies, one by Austin (Boston, 1888), the other by Martyn (New York, 1890; American Reformers Series). Consult also works dealing with the anti-slavery struggle.

PHILLIPS ACADEMY. An important boys' school at Andover, Mass., commonly known as Phillips Andover. It was founded and opened in 1778 through the gifts of members of the Phillips family. The school was incorporated in 1780, and in 1807 the trustees were empowered to receive and hold funds for a separate theological institution, and the Andover Theological Seminary was accordingly established in the following year. In 1830 the Teachers' Seminary was established in anticipation of the normal schools, but in 1842 was merged in the parent academy, and is its present scientific department. In 1901 an archæological department, with valuable collections and an endowment for instruction, research, and publication, was established by two anonymous donors. The Academy, with its sister institution at Exeter, has always been regarded as a typically democratic American school. During the early years of its history it had as students many of the famous men of the country. The equipment has in recent years been largely increased by new buildings, among them several dormitories and a gymnasium. The standards of Yale and Harvard, to which most of the graduates go, form the basis on which the work of the school is arranged. The academy had in 1902 an attendance of 400 and 24 instructors. The endowment was $400,000, the gross income $70,000, and the college property was estimated at $500,000, exclusive of invested funds. The library contained 60,000 volumes.

PHILLIPS ACADEMY. One of the oldest and most renowned of American schools, at Exeter, New Hampshire, commonly known as Phillips Exeter. It was founded in 1781 and opened in 1783. The school was the first educational institution incorporated by the Legislature of New Hampshire, and has its name from John Phillips, its founder, who was a generous benefactor of Dartmouth College and of Phillips Academy, Andover, Mass. It early gained a national reputation, and drew students from all sections of the country. The alumni in 1903 numbered about 7000, among its earlier students being Daniel Webster, George Bancroft, Edward Everett, John A. Dix, and Jared Sparks. In 1902-03 over 300 students were enrolled and the faculty numbered 16. The school buildings, many of which have been built since 1886, include well-equipped laboratories, fine dormitories, an administration building, gymnasium, and a building designed as a common dining-room and for the entertainment of visiting alumni. The buildings with their equipment are valued at about $300,000. The endowment in 1902 was about $400,000, and the annual income $100,000. Characteristic of the school have been its democratic spirit and its successful application of a system of self-government.

PHIL'LIPSBURG. A town in Warren County, N. J., on the Delaware River, opposite Easton, Pa., and on the Pennsylvania, the Lehigh Valley, the Lackawanna, and the Central of New Jersey railroads (Map: New Jersey, B 2). It possesses valuable advantages for an industrial centre, the river affording good water-power and the railroads making accessible a supply of coal and iron ore. Its manufacturing interests are extensive, and include shops of three of the railroads that enter the town, also iron furnaces, sheet iron mills, foundries and machine shops, stove works, boiler works, horseshoe mills, drill works, and large silk mills. Settled in 1749, Phillipsburg was incorporated in 1861. It is governed under a revised charter of 1875, by a mayor, annually elected, and a council which controls appointments of most of the subordinate officers. Population, in 1890, 8644; in 1900, 10,052.

PHILL'POTTS, EDEN (1862—). An English novelist, son of Captain Henry Phillpotts. He was born at Mount Aboo, in India, November 4, 1862, and was reared at Plymouth, England. At the age of eighteen he became clerk in the Sun fire insurance office—a position which he held for ten years. A number of earlier novels were followed by two great successes, *Lying Prophets* (1897) and *Children of the Mist* (1898). In these novels Phillpotts depicted Devonshire life with remarkable power and beauty. In their coloring they recall Blackmore, and in their tragedy they are akin to Hardy. There have since followed *Loup Garou* (1899); *The Human Boy* (1899), which is a volume of stories illustrating schoolboy humor; *Sons of the Morning* (1900); *The Striking Hours* (1901), a collection of short Devonshire stories; *The Good Red Earth* (1901); and *The River* (1902).

PHI'LOBIB'LON. A prose treatise by Richard Aungerville, known as Richard de Bury, Bishop of Durham (1345). The author, an enthusiastic collector of books, and founder of a library at Oxford in connection with Durham College, writes in praise of learning, of the value and proper care of books, with advice to students. It was printed first at Cologne in 1473, at Paris in 1500, and at Oxford in 1599. The latest English translation is that of E. C. Thomas (London, 1888).

PHI'LO BYB'LIUS. See SANCHUNIATHON.

PHILOCH'ORUS (Lat., from Gk. Φιλόχορος). A Greek historian who is said to have lived at Athens between B.C. 306 and 260. According to Suidas, he was one of the bitterest opponents of Demetrius Poliorcetes and of his son, Antigonus Gonatas, and was put to death by the latter after the conquest of Athens (about B.C. 260). He is known chiefly by his *Atthis*, a history of Athens from the earliest times to B.C. 262, in seventeen books. By later writers it is frequently referred to as one of the most thorough and reliable of the special histories of Attica. Important fragments are preserved in Müller's *Fragmenta*

Historicorum Græcorum (Paris, 1841). Consult: Strenge, *Quæstiones Philochoreæ* (Göttingen, 1868), and Siebelis's edition (Leipzig, 1811).

PHILOCTE'TES (Lat., from Gk. Φιλοκτήτης, *Philoktētēs*). A Greek chieftain who inherited the bow and arrows of Heracles. He started with seven ships for the Trojan War, but was bitten on the way by a serpent at Lemnos. On account of the stench of the wound, the other Greeks left him behind and went on to Troy. As an oracle, however, declared that Troy could only be taken by the arrows of Heracles, Odysseus and Diomedes went to Lemnos to fetch Philoctetes. He accompanied them to Troy, slew Paris, and returned safely home. The drama *Philoctetes* by Sophocles is still extant, the legend having been also dramatized by Æschylus and Euripides.

PHILODE'MUS (Lat., from Gk. Φιλόδημος). An Epicurean philosopher of the first century B.C. He was born at Gadara in Syria, and studied under Zeno. Besides thirty-four epigrams, mostly erotic, in the Greek anthology, Philodemus wrote works on philosophy, of which copies much mutilated were discovered at Herculaneum. They are: *De Rhetorica*, edited by Gros (1840) and by Sudhaus (1892-95); *De Musica*, edited by Kempke (1884); *De Vitiis*, by Göttling (1830) and Ussing (1868); *De Ira* and *De Pietate*, by Gomperz (1864-66); and *De Morte*, by Mekler (1886). Martha makes him the editor of Lucretius and many attempts have been made to prove that Cicero got his knowledge of Epicureanism from Philodemus and so from Zeno.

PHI'LO JUDÆ'US (Lat., from Gk. Φίλων Ἰουδαῖος, *Philōn Ioudaios*, Philo the Jew). A Jewish-Hellenistic philosopher, born at Alexandria about B.C. 25. He belonged to one of the most wealthy and aristocratic families—his brother Alexander was the Alabarch or president of the Jewish colony at Alexandria—and he received the most careful Jewish education, consisting largely of a study of the Old Testament in the Septuagint version. He also became acquainted with the writings of the Greek philosophers. He went to Rome, A.D. 39 or 40, as the advocate of his Alexandrian brethren, who had refused to worship Caligula in obedience to the Imperial edict. He has left an account of this embassy, the result of which was not satisfactory. Of his life we know little except what is recorded above.

While strict in all that pertained to ceremonial and ritual, in doctrinal matters Philo was a bold allegorizer. A literal interpretation of the Scriptures he regarded as superstitious and mean. Especially did he explain away all theophanies recorded in the Old Testament, as told in accommodation to the sensuous character of human minds, which needed anthropomorphic representations of supersensible truth.

His writings develop his ideas and his system in the two directions indicated. In that division of his writings principally which treats of the creation (*Kosmopoïa*), he allows allegory to take the reins out of his hands; in that on the laws (*Nomoi*), on the other hand, he remains remarkably sober and clear, extolling the Mosaic legislation throughout, at the expense of every other known to him. In a very few instances only he is induced to find fault, or to alter slightly, by way of allegory, the existing ordinances.

His idea of God is a preëminently theosophic not a philosophic one. God alone is the real good, the perfect, only to be imagined as the primeval light, which cannot be seen by itself, but may be known from its rays, that fill the whole world. He has no attributes, and therefore no name, and reveals himself only in designations expressive of this 'inexpressibility.' He is better than virtue and knowledge, better than the beautiful and the good (*Kalokagathia*), simpler than the one, more blissful than bliss. He is the existing unity or existence itself, self-sufficient, free from pain and fear and participation in evils, and full of happiness. Dynamically God is omnipresent, but not really. Indeed, so far is God really from filling the world with his presence that the world, on the contrary, finds its place in God. And yet the God who comprehends within himself the material universe is so exalted above the world and so remote from it that a point of contact cannot be found between them; hence the need of an intermediate class of beings to stand between them. These were found in the spiritual world of ideas, which are not only 'ideals,' or types, in the Platonic sense, but real, active powers, surrounding God like a number of attendant beings. They are his messengers, who work his will, and by the Greeks are called good demons; by Moses, angels. There are very many different degrees of perfection among them. Some are immediate 'serving angels;' others are the souls of the pious, of the prophets, and the people of Israel, who rise higher up to the deity; others again are the heads and chief representatives of the different nations, such as Israel does not need. The *Logos* comprises all these intermediate spiritual powers in his own essence. (See article Logos for Philo's views on this part of his system.) Man is a microcosm, a little world in himself, a creation of the Logos, through whom he participates in the deity. The ethical principles of Stoicism Philo identified with the Mosaic ethics, in which the ideal is most exalted moral perfectibility or sanctity, and man's duties consist in veneration of God, and love and righteousness toward fellowmen. Philo holds firmly the belief in immortality. Man is immortal by his heavenly nature; but as there are degrees in his divine nature, so there are degrees in his immortality, which only then deserves this name when it has been acquired by an eminence of virtue. There is a vast difference between the mere living after death, which is common to all mankind, and the future existence of the perfect ones. Virtue and sin both have all their rewards within themselves; but the soul, which is 'pre-existing,' having finished its course in the sublunar world, carries this consciousness with it in a more intense and exalted manner. Paradise is oneness with God; there is no hell with bodily punishments for souls without a body, and no devil in the Philonic system. (For the relation between Philo, as the representative of the Judeo-Alexandrian philosophy, and other contemporary philosophic tendencies, see NEO-PLATONISM). Of the many works left under his name, several have been declared spurious, but in some cases without much show of reason. His writings have been published by Richter (Leipzig, 1828-30) and by Tauchnitz

(ib., 1851-54). See Gfrörer, *Philon und die alexandrinische Theosophie* (Stuttgart, 1831); Dähne, *Geschichtliche Darstellung der jüdisch-alexandrinischen Religionsphilosophie* (Halle, 1834); Wolff, *Die philonische Philosophie* (Leipzig, 1849); Delannay, *Philo d'Alexandrie* (Paris, 1867); Drummond, *Principles of the Jewish-Alexandrian Philosophy* (London, 1877); id., *Philo Judæus* (ib., 1888); Freudenthal, *Die Erkenntnislehre Philos von Alexandria* (Berlin, 1892).

PHIL'OLA'US (Lat., from Gk. Φιλόλαος) (c.450 B.C.). A Pythagorean philosopher, born at Tarentum or Croton. Little is known of his life. Some fragmentary writings are attributed to him, in which he sets forth the teachings of Pythagoras. The authenticity of these writings has been the subject of serious study and of dispute among critics. To him is ascribed a knowledge of harmonic ratio, and of the fact that the number of vertices of a cube is an harmonic mean between the number of faces and the number of edges. He seems also to have known with reasonable exactness the periods of revolution of the planets. Consult: Boeckh, *Philolaus des Pythagoräers Lehren, nebst Bruchstucken seines Werkes* (Berlin, 1819); Schaarschmidt, *Die angebliche Schriftstellerei des Philolaus* (Bonn, 1864).

PHILOLOGICAL ASSOCIATION, American. A learned society, organized at Poughkeepsie, N. Y., in July 1869, from the Classical Section of the Oriental Society (q.v.), with Prof. William D. Whitney, of Yale, as the first president. Its object is the advancement and diffusion of philological knowledge. It has a membership of about 600, and its annual meetings are held in such cities as the society may, from year to year, select. The publications of the association are annual volumes of *Transactions*, in which are printed in full such papers as the executive committee may select, and *Proceedings*, giving an account of the annual meeting and brief abstracts of all papers presented to the society.

PHILOLOGICAL SOCIETY, British. A learned society founded in London in 1842, to investigate and promote the study and knowledge of the structure, the affinities, and the history of languages. It added to these objects the publication of the 'New English Dictionary,' work upon which was begun in 1857, under the editorial charge of Dr. James A. H. Murray, assisted by many scholars and men of science in Great Britain and the United States. The first part was published in 1884, and the bound volumes issued to 1903 bring the Dictionary down to the letter M, though some parts in O and Q have also been sent out in pamphlet form. The society has its headquarters at University College, London, and holds its annual meeting in May and monthly meetings from November to June, at which papers are read, the more important ones being afterwards published in volumes of *Transactions*, distributed to members without charge, while summaries or synopses of the other papers are printed in the monthly *Abstract*, also published by the society.

PHILOL'OGY (Lat. *philologia*, from Gk. φιλολογία, love of literature and learning, love of language and history, from φίλος, *philos*, dear + λόγος, *logos*, word). In modern English usage, the science of comparative linguistics. As speech may be studied either in its expression or in its origin, philology may occupy itself with linguistic expression, with literature, or with the genesis and laws of language. French and German scholars usually employ the word in the former sense, and many English scholars prefer to understand by philology the study of literary expression, even including all that is revealed through literature. Nevertheless, although this is perhaps the more legitimate use of the word, yet the tendency of the day, even among French scholars, and still more among English-speaking people, is to confine philology to the study of language, and to divide this study into (a) linguistics proper, including phonetics, and (b) comparative philology, the study of language by a comparison of different languages in the same family. Languages may be divided roughly, and merely for convenience without scientific accuracy, into several types. Of these the most important are the isolating or monosyllabic, the agglutinative, with its subdivision the incorporating or synthetic, the inflectional, and the analytic. The isolating group, formerly supposed to be represented by Chinese, is characterized by invariable monosyllabic roots. The opinion which once considered this group to be the most primitive is now rejected by many who hold that the type represents, on the contrary, the culmination of a long linguistic evolution. The agglutinative type, which includes the majority of languages, such as the Dravidian, Malayo-Polynesian, Uro-Altaic, and African, is marked by the addition of prefixes, suffixes, and infixes to the so-called root (q. v.) or base. These additions have, at least at first, distinct meanings of their own, but in course of time the meanings become obscured, the particles themselves become fused in signification with the base, and lose their individuality. The result is the type of language called inflectional. (See Inflection.) In the incorporating or polysynthetic languages, represented by the American Indian groups, the verb absorbs the name, pronouns, adjectives, and adverbs, thus marking a higher degree of agglutination than the agglutinative languages themselves. The analytic languages are a development of the inflectional. In time the inflections tend to become weakened in force, and to require the help of pronouns, prepositions, and auxiliary verbs. When the inflections have in the main disappeared, and their places have been taken by individual words, the language is termed analytic. To this group belong such languages as English, French, Italian, Persian, and Hindustani, as distinguished from the inflectional groups represented by the Semitic and Indo-European families, which include Hebrew, Arabic, Sanskrit, Greek, Latin, and German. It is, however, customary to confine comparative philology to the study of the group of Indo-European languages, though there is no reason why the term should not be applied to any other group as well. The different aspects of philology thus outlined are treated under different heads, to which the reader is referred for special discussion. See the articles on Language, for the psychology of language; Albanian, Armenian, Indo-Iranian, etc., for special branches; and for classical philology, see the articles on Greek Language and Italic Languages.

History of Comparative Philology. Until the discovery of Sanskrit no comparative philology was possible. Sir William Jones in 1786 and Schlegel in 1808 connected Sanskrit with Greek and Latin; but Franz Bopp (q.v.) first correlated the facts observed by others and founded the science. Approaching the subject from the philosophical side, Bopp devoted himself to glottogonic problems, his chief aim being to discover phonetic laws and the genesis of forms. He was at first influenced by Friedrich Schlegel, and opposed the doctrine of mechanical affixes (called agglutination), holding rather to an inner inflection as the index of different relations, though he admitted into the root (in the aorist, etc.) the abstract verb *as*, 'be.' But this view (1816) was soon changed, and Bopp in 1819 himself opposed this philosophy of language and taught that verbal endings, *-ti* for example, are really pronominal in origin. In his *Conjugationssystem* and *Vergleichende Grammatik* (1833) he went still further, assuming a pronominal origin for case-endings as well as verbal endings (*-s* of the nominative being *sa*, 'he,' etc.). It is unnecessary to give in detail the mixture of fact and fancy which from a later point of view, alternately adorns and disfigures this first exhaustive attempt to create a science of grammar. His monumental work was followed by the equally important *Geschichte der deutschen Sprache* (1848) of Jakob Grimm (q.v.), who with Rask (q.v.) extended the comparison of forms and discovered phonetic laws of change (see below). After Grimm, the *Etymologische Forschungen* (1836) of Pott (q.v.) established a rationalized system of etymology for the whole group of Indo-European languages. Bopp, Grimm, and Pott may justly be called the creators of the comparative study of language. Agglutination, monosyllabic roots, *a*, *i*, *u*, as the three essential vowels, and a mother-language, these characterize the belief of the first period of the study represented by them. This period extends to the appearance of Schleicher's (q.v.) *Compendium* (1862), which systematized the views of his predecessors, while adding to them his own more stringent but false conception of language as a living organism, which in his opinion should be studied by the methods of natural science. An increasing respect for 'phonetic law' (q.v.) marks the close of this period, in which the names of Schleicher and Georg Curtius (q.v.), the latter being one of the first to insist on phonetic regularity, are most prominent. Different languages now began to be studied more carefully, each for itself, and the laws of each more strictly established. New problems arose, such as that of the parent language and primitive vocalism, but Schleicher stood on the platform of his predecessors as regards the old problems. The parent speech Schleicher represented as the root of a tree, with trunk, branches, and twigs representing descendant languages and dialects (the so-called *Stammbaum Theorie*). Like Curtius, he held that the simpler vocalism of Sanskrit was more antique than the variation shown in Europe, and believed that Sanskrit *a* was older than Greek *α*, *ε*, *ο*.

Ten years later, in 1872, Johannes Schmidt (q.v.) published his *Verwandtschaftsverhältnisse der indogermanischen Sprachen*, which put the interrelation of the different Indo-European languages in a new light. Instead of a family-tree with its organic growth and dialect-twigs, Schmidt set forth the *Wellentheorie*, according to which the different languages had rolled away like waves from a common centre. This view replaced Schleicher's and in a somewhat modified form has been adopted by Leskien, Schrader, and other scholars of the present day. According to it, certain words and forms are explained as being common to one section till that splits up and so leaves the contiguous peoples in possession of a common linguistic property, while those dwelling farther apart possess linguistic property which, although originally practically identical, has become so differentiated as frequently to be mutually unintelligible. The obvious objection is that some wave-segments may have lost material formerly possessed and others made for themselves what is also found in other segments. This change of view is paralleled by that in regard to vocalism. Instead of assuming that the primitive language had only *a*, *i*, *u*, and that Sanskrit *a* was an older phase as compared with Greek *α*, *ε*, *ο*, the scholars of the second period, which began about 1862, Brugmann, Osthoff, Collitz, and others, showed that the varied phase was older. During this period, as for a dozen years previously, much of the best effort of philologists was directed toward individual languages, the publication of texts, lexicons and grammars, which gave much new material in many directions, notably in the Indo-Iranian field. Benfey, Roth, Böhtlingk, Westphal, Curtius, and Max Müller thus furthered the cause of general comparative philology. Moreover, new languages were added to the group, such as Albanian, Armenian, and Phrygian. At this time also began to be discussed afresh the problem of new formations. The answer to this was given in Whitney's enunciation of the theory of analogy (q.v.). By imitation of the old, the new is produced. But especially were the scholars now calling themselves young grammarians insistent upon one principle which became a shibboleth. This was the invariability of phonetic law (q.v.). In the seventies and eighties the various philologists of note in Germany were more or less split up into cliques headed by Georg Curtius, Fick, Schmidt, Brugmann, and others, but this was due less to a radical difference than to personal feeling and may be passed over. In America, Whitney centred his attention upon the fundamental question of the origin and growth of language, and in so doing came into conflict with Max Müller. Müller claimed that language gives conceptions which could not exist without speech. Thought and word were, in his view, convertible terms. Whitney held, on the other hand, that words are only signs associated with conceptions, and that every language known to us is a body of conventional signs for ideas. Müller denied that any man can change a language; Whitney maintained that individuals initiate changes subsequently accepted by the community, which makes the changes parts of its language by the simple employment of them. To Müller, language-study was a physical science, even in his final revision of the views first expressed in 1862. In all this, Müller showed that he was of the school of Schleicher, whom, indeed, he cited as his chief authority in teaching that the study of language is a physical science. Language is, however, a human institution, not a physical science, and the failure to recognize this fact undermines the foundation of Müller's

view. Müller further held that no new roots have ever been made since the original root-making period, and he treated these primitive roots as if they were necessarily non-derivative forms. In point of fact, many of the 'roots' of the primitive tongue may be reductions from compound words comparable to 'preach' and 'cost' in English. (See ROOT.) Such primitive roots in Müller's opinion, however, are ultimate facts, the nuclei in a chaos of interjectional or imitative sounds. Whitney upheld the view that language was composed of a body of conventional signs originally of depictive character of any sort, onomatopoetic or not. In one respect only was there an advance in Müller's system on Schleicher. He accepted the 'physical science' view of language, but he rejected the notion of a primitive Indo-European language from which Sanskrit, Greek, Latin, Germanic, Slavonic, and Celtic were derived, though even here he spoke of the mother-language of the whole family. At the same time he argued that where in two dialectic forms of one word there are two different consonantal sounds they must go back to an indistinct pro-ethnic consonant capable of developing into either, which is, in the premises, an impossible assumption. It is remarkable that German scholarship added little to the discussion of these fundamental questions. An exception, however, must be made in favor of Paul, whose *Prinzipien* (1880) discussed at length and acutely the causes leading to phonetic and morphologic changes. On the other hand, all the great discoveries of comparative philology have been made by Continental scholars.

THE FIELD OF INVESTIGATION. Turning now from this historical outline of the growth of the science of philology to the subject-matter of the science, it will be necessary first to explain the field of investigation. Comparative philology as applied to the Indo-European or Indo-Germanic languages (q.v.) first demarcates those languages from others. This family constitutes a single group, separated both by vocabulary and by structure from other groups of languages. Whether the Indo-European group had at any time a common origin with other groups passes human knowledge. Many scholars (Ascoli, Abel, and others) have made abortive attempts to connect Indo-European forms with Semitic, Mongolian, and Egyptian forms, but nothing cogent has been produced to show that there is any radical affinity between them, though there has often been connection. The name Indo-European is only one of many, but at present the usual one, to designate the group called in German quite as often Indo-Germanic, and in English frequently Aryan. The last name is one often used by German scholars to designate the narrower group of Indo-Iranian. The members of the Indo-European group are the sub-groups known as Indic, Iranic, Anatolic, Hellenic, Celtic, Teutonic, Balto-Slavic. Some scholars add Albanian as a separate sub-group and some particularize Armenian as a subdivision on a par with Hellenic (see below). These sub-groups include a great number of languages and dialects, various in themselves and in some cases intricately combined. The chief elements making each group are:

INDIC. Sanskrit and the pre-Sanskrit Vedic language. The former name is often made to cover both divisions, but, like English in relation to Anglo-Saxon, though conveniently used, it is not accurate. There was no Sanskrit language till after the Vedic period. Whether Sanskrit is derived from the Vedic may be doubted. It is closely connected with that earlier language, but it is quite possible that the two are dialectic variations from the start. Evidence given by the Linguistic Survey of India seems to show that there were two main Aryan invasions of India, entering by two different routes and at different times; that those speaking the Vedic language were the first comers, afterwards pressed to the wall by the ancestors of those who in course of time spoke what we call Sanskrit. Opposed to Sanskrit is Prakrit (q.v.), a general term for various dialects recognized at an early date as being not Sanskrit and yet not foreign. The language of Hinayana Buddhism, Pali (q.v.), was one of these patois. It is closely related to the Vedic language, and may be as old. Corresponding to the patois Prakrit dialects of antiquity are the modern provincial dialects, Bengali, Panjabi, etc., reflecting, however, more or less the effect of Sanskrit. A European offshoot of this division is the Gypsy language of Europe, many of whose words (verbal roots) are still identical with those of Sanskrit. (See GYPSIES.) The oldest literary remains of this group are from B.C. 1000 to 1200, though some scholars assign a much greater antiquity to the Vedas, the earliest Indic literature.

IRANIC. This group, the name of which is derived from Iran (Eran), the great plateau including Persia, Afghanistan, and Baluchistan, can be traced from quarters contiguous with the Indic group, and is closely connected with the latter. In fact, Indic and Iranic (Aryan in the narrower sense) are both dialects of the same language rather than separate languages. Especially is this true of the Old Bactrian (Avestan or Zend) division of Iranic (see AVESTA), the sacred literature of which extends back to about the seventh century B.C. Opposed to this division is the Old Persian (q.v.), sometimes called the Western dialect in antithesis to Avestan as the Eastern. Old Persian is the language of the cuneiform inscriptions of the Persian kings, and this alone survived as a spoken language, being gradually modified into Pahlavi (q.v.) and New Persian. See PERSIAN LANGUAGE.

ANATOLIC. This group comprises Armenian (which was formerly regarded as Iranic and is now sometimes accorded a separate division), Phrygian (q.v.), and Scythian, and until lately was supposed to be represented by Lycian and Carian also. Later investigations, however, have shown that the two latter do not belong to the Indo-European group, and Scythian applies only to such remnants of Indo-European origin as are represented by some of the names of nomads in Southern Russia and on the border of Asia Minor. As such the division is maintained by Fick, but it rests on very doubtful evidence. The oldest literature is of the fourth century, unless the recently (1902) interpreted 'Arzawa' language assigned to Cappadocia be regarded as Indo-European (c.1400 B.C.).

HELLENIC. This comprises all the old Greek dialects, Ionic, Doric, etc.; Albanian, a mixture of Greek and foreign elements; also the modern dialects of Greece. (See GREEK LANGUAGE.) The literature goes back to about B.C. 1000.

ITALIC. This division includes Latin, Umbrian, Oscan, and other minor dialects; modern dialects,

in part primitive, in part due to foreign elements, Italian, Provençal, French, Spanish, Portuguese, Roman, etc., called in general Romance. The literature goes back to the third century B.C. inscriptions still older). See LATIN LANGUAGE; ITALIC LANGUAGES; ROMANCE LANGUAGES.

CELTIC. This group comprises (1) Cymric (Welsh, Breton, Cornish); (2) Gadhaelic (Erse, Manx, Gaelic). The literature can be traced to the eighth century A.D. See CELTIC LANGUAGES.

TEUTONIC. Originally Gothic (see GOTHIC LANGUAGE) and non-Gothic were the only divisions. These subsequently, on the basis of one euphonic change, were differentiated into Low and High German. The old divisions, still recognized by many scholars, are: (1) High German (Old, Middle, New); (2) Low German (Gothic, Saxon, Dutch, Frisian); (3) Scandinavian (Norse, Icelandic, Swedish, Danish). Gothic literature (translations of the New Testament) is of the fourth century A.D., but linguistic forms cited by Roman writers are earlier. See TEUTONIC LANGUAGES.

BALTO-SLAVIC (SLAVONIC). It is customary to unite these languages, which, however, stand as far apart as do Indo-Iranic. The Baltic (or Lettic) division, embracing the Old Prussian (q.v.), Lithuanian (q.v.), and Lettic (q.v.), the last-named spoken in Courland and Livonia, forms a unit over against the Slavic division (see SLAVIC LANGUAGES), which is divided into a large number of dialects incapable of being subdivided into different groups, though one division into Eastern, (South) Eastern, and Western, and another into two subdivisions are sometimes made. But phonetics and morphology together prevent such classifications except as a matter of convenience, all the dialects being more or less related, but not in such a way as to show that any of them formed sub-groups. A common and convenient geographical distribution is into the Western group, Polabian (formerly spoken in North Germany), Polish, Sorbian (represented by the Wendish spoken in Lusatia), Czechish (spoken in Bohemia, Moravia, etc.), and the (South) Eastern group, Servian, Croatian, Slovenian, Bulgarian, on the one hand, and Russian, on the other. Literary fragments go back to the eighth century. In the (narrower) Baltic division, however, a catechism of the sixteenth century represents the oldest known form of the dialect.

INNER RELATION. Having thus sketched the geography of these parts of the Indo-European languages, we must next inquire whether any of these parts hold to each other especially close relations. Much that here seems obvious shows itself to be misleading. Thus Latin is often regarded as standing in a peculiarly close relationship to Greek. In point of fact, however, while the Greek and Latin literatures are closely connected, there is no special kinship of the two languages. To detail all the groupings by subdivisions that have been urged by different scholars would take too much space, but the most practical historical differentiation is based on the varying treatment of the gutturals and vowels. In Hellenic, Italic, Celtic, and Teutonic, *k* and *q* represent the *ś* and *k* of the Eastern languages. The Sanskrit tenuis is preserved in the Western group, but the media and aspirate are modified to *j* and *h* (confused with the palatal evolution). The Western group had a pure *k* instead of the *ś*-series, and *q*-sounds (tending to become labials) instead of the *k*-series. Examples of the *k*-series are Hellenic *ἑ-κατόν*, Italic *centum*, but Indic *śatam*; *ὄχος*, wagon, but Avestan *vazaiti*: of the *q*-series, Italic *quod*, Indic *kad*. In vocalism the Eastern group has a simpler series than the Western. Now between these extremes lies the Balto-Slavic (and in part the Anatolic) system, which agrees with the Eastern group in having the *ś* and *k* series (as against the *k* and *q* series), but with the Western group in its more varied vocalism. There are no divisions of the languages which are of so marked a character as these of the '*śatam*' and '*centum*' divisions. Latin stands near to Celtic in some forms (future and passive), but near to Sanskrit in others (e.g. the ablative). So in other aspects of morphology, Balto-Slavic, Sanskrit, and Greek are akin, while in others they stand apart, and such resemblances and divergencies are found among the other languages as well. What the inner relation may have been cannot be more nearly established by a comparison of forms, still less of vocabulary, and it seems safest to establish as sub-groups only Eastern (Middle) and Western divisions. That Indic and Iranic lie so closely together may be due rather to their closer synchronism than to an originally greater similitude.

Before proceeding with the discussion of the inner relationship of these groups as shown by sounds, forms, and syntax, it is necessary to revert to the question of the primitive language, which, as was shown above, occupied so large a share of the attention of Schleicher. Since his day the problem has assumed a new form which may be studied under two aspects, geographical and dialectical. It was the opinion of the older Sanskritists that the earliest home of the Indo-Europeans was on the Pamir tablelands. Other sites have been assumed, the plains of Europe, Scandinavia, and many other centres. But on the basis of a comparison of the common vocabulary of all the languages and the state of culture represented by it, present opinion, induced largely by the results of Schrader's studies, inclines to the belief that the original home of the Indo-Europeans was on the plains north of the Carpathian Mountains. A very important contribution to the question was made by Schmidt, who tried to show that the duodecimal system of the Indo-Europeans was derived from Semitic sources. The discovery in 1902 of the Arzawa Letters (see above) would strengthen the belief in an early intercommunication between Indo-Europeans and Semites. These data, if accepted, would show that the Indo-Europeans at a very early period were near neighbors of the Semites, and perhaps in close communication with them. Further, it is known that trade communication between the north of Europe and the southeast, possibly Semitic, took place at an early date, and, finally, it is scarcely to be doubted that Indo-European language and Indo-European race are not terms implying an identity of race and language. In short, language proves nothing with regard to race. This truth leads to a clearer insight in regard to the 'parent speech.' Instead of imagining that there was a racial unity once marked by linguistic unity, we must inquire whether, in giving up racial unity as shown by language, we must not also renounce all attempts to establish a former linguistic unity. The answer will un-

doubtedly be an affirmative, and it is rendered more probable by all that we know of modern languages. The German dialects, for example, show no trace of ever having been identical in form. Still more striking is the illustration given by Slavic as compared with Baltic. In a word, there was no parent speech of the Indo-Europeans; but there were always related dialects. (See DIALECTS.) Thus the smallest dialect, geographically speaking, of Greece or Rome, may preserve forms as ancient as any other. The idea of a language-unity splitting up into dialects and these again into sub-dialects is a false conception. Co-dialectic forms is the only right expression. All efforts made to trace out a parent speech are based largely on doubtful data of the use of words regarded as original, although we do not know whether the words may not have been borrowed. All reconstructures of the parent speech, whether in the form of literature (such as Schleicher indulged in) or in the form of reconstructed hypothetical words, which are supposed to represent the sound of the *Ur-sprache* and are constantly employed in our comparative grammars, are pure fictions of the imagination, and are not to be regarded as representing an actual prehistoric condition of the language. We know the Indo-European languages only in dialectic form, as spoken by various races over a wide area. The dialects are divarications from each other, not, so far as we know, from any unitary parent speech. A universal parent speech is an historical possibility, but an Indo-European parent speech is merely a convenient hypothesis, which, however, leaves more to be explained than it explains, and may best be discarded, however pleasing it be to the mind which prefers unity.

PHONOLOGY. The regular interchange of certain sounds in the different languages of the Indo-European group was generally postulated at an early period without the later insistence on the necessity of regularity. At first it seemed as if there were exceptions which could not be explained by any law. The sounds first compared were consonantal, as these seemed most regular. Their correspondence in certain of the Indo-European languages was formulated by what is known as Grimm's law (q.v.).

The vowel-system took longer to explain and the consonantal system required modification. In the case of the vowels, apart from the determination of the long disputed point whether the *a*, *e*, *o* of the Greek, or their equivalents in one *a*-sound, as in Sanskrit, represented the older state, the vowel-system was seen to be more regular as soon as the primitive existence of sonant nasals and liquids was recognized. The chief modifications of Grimm's law and further contributary laws were established during the last quarter of the nineteenth century. At the same time was raised the question in regard to the original vowel-form of roots and that of its changes in *Ablaut* or modified vowels and diphthongs.

The priority of the Western *a*, *e*, *o*, as compared with the Asiatic monotone *a*, was proved by Amelung and Brugmann at about the same time. Next was shown the existence of an Indo-European *e*, that is of a real palatal vowel, in Sanskrit itself. This was proved by Collitz, and independently by Verner, through demonstrating that when a Sanskrit *a* (= *e*) follows a guttural it palatalizes it and hence must itself be palatal. Thus Sanskrit *ca* = *τε*, *quc*. Osthoff and Brugmann, again, pointed out the existence in Greek of the Sanskrit *l* and *r* vowels, as shown e.g in *πατράσι* (= Sk. *pitṛṣu*), *ἔδρακον*, etc. Then, as opposed to the view of the Hindu grammarians and early European scholars, it was shown that in the series *i*, *e*, *ai*, the simple vowel is no more radical than is the *guna* form, *e*, *ai*, or, in other words, we cannot speak of the stem in *φέυγω*, to take an analogous case, as being less original than that in *ἔφυγον*.

The chief modification of Grimm's law was made in 1875 by the complementary law of accent, which goes by the name of Verner's law (q.v.).

In discussing consonantism, the designations of other than the guttural series are self-explanatory, but in the guttural series there is great confusion of nomenclature. Thus the Indo-European languages had palatal sounds, *c*, *j*; dentals, *t*, *d*; labials, *p*, *b*, both aspirated and non-aspirated. So they had aspirated and non-aspirated, surd and sonant, gutturals, *k*, *g* (*kh*, *gh*). But these latter, being, as explained above, of twofold form, have different designations. There are two series, the palatal and non-palatal guttural series. These are sometimes distinguished as palatal and velar, but the former is also called the *ś*-series, and even the *k*-series; while the latter is called the *q*-series and also the *k*-series. The velar *k*-series was from the beginning distinguished from the palatal guttural by being a sort of back guttural, with a tendency to develop a half-vowel sound (*q*^{u} or *k*^{u}), which was lost in special languages. The two sounds either united or the guttural became more labialized, Sanskrit *ku*, Latin *quo*, Gothic *hva*, a tendency that reached an extreme in Greek, where this guttural is often represented by a labial, as in *πο* (also before nasals and liquids), though sometimes dentalized, as in *τε* (before *ι*, *ε*), while sometimes coinciding with *k* (*κῶς*). Besides gutturals and palatals, the Indo-European group possessed the consonantism just described, but it was defective in fricatives and spirants (e.g. *f*, English *th*, *z*). Peculiar to the older language are the aspirated sonants retained in the Indo-Iranic group beside aspirated surds, as well as the modified nasals and sibilants, *n*, *s*, including *m̥*, the final half-nasal, and final half-sibilant. As already explained, Indo-European had as half-vowels *y*, *v*, *l*, *r*. Lingual sounds (found in Sanskrit) appear to be borrowed from the Dravidians.

Before passing on to the subject of morphology it will be necessary to speak of one of the most important topics discussed, though not definitively settled, in the last few years. Verner showed that accent or stress influenced the character of consonants according to the accentuation of the syllable. The effect of stress, however, as already explained, is also patent as regards the vowel, which, as in *οἶδα*, *ἴδμεν* (originally *ἰδμές*), shifts with the accent. But of late it has been shown that another very important law of accentuation has been at work in determining the form of stems. Fick and Möller have emphasized the importance of pitch, that is, musical accent, as contrasted with stress accent. They show that there is a certain relation between the palatal vowel and a high pitch, and a guttural vowel and a low pitch, a relation explicable on physiological grounds: the action of the vocal or-

gans naturally associating the high pitch with the palatal *e* and the low pitch with the guttural *o*. Thus there is a natural connection between the accent or non-accent and the form of the two vowels in λεγω, the *e* vowel having the high pitch, the *o* vowel having the low pitch. This matter has not yet been thoroughly investigated, and there are many phenomena not yet explained by it. For example, in λόγος the low pitch has the stress. But at all events, accent is evidently a factor which will, when properly understood, explain much in stem-formation.

Morphology. This studies change of form and the cause of change. The chief factors tending to change the form of words are 'phonetic degeneration,' as it used to be called, or phonetic variation and growth, due partly to individual peculiarities, but more to the attrition of speech, force of expression, the law of least resistance, and the interaction of the individual and his environment. Change of stress and change of pitch and the substitution of stressed accent for pitch affect the form as well as the accent of words. Analogy (q.v.), especially false analogy, causes changes, in the endings particularly, and the growth or change of function in one class of words is liable seriously to affect the form and even the existence of words of another class. Imitation due to association may be conscious or unconscious. Complete changes in the pronunciation of a vowel may occur over a wide area in a short time and then remain, or as suddenly disappear. Most of these changes of form are the result of a long series of gradual minute alterations, intervening in time, both in phonetics and in morphology. Difference of meaning may be mentioned last as having had effect on form, a factor more or less connected with accent. Apart from these questions of the philosophy of change, morphology has to do with the forms as presented in language, which may most conveniently be discussed under the head of roots (see Roots), stems, the forms of nouns, and the forms of verbs.

In regard to the stem-complex of root and ending, apart from a vague theory of Westphal that 'near' and 'distant' sounds have something to do with stem-formation, only one theory has been opposed to Bopp's agglutination theory. This is a profound study by Ludwig, marred only by the assumption of absolute lawlessness in phonetics. The points made are that the endings serve different purposes, a first person serves as third, a locative as a genitive, etc., and the further back we go the looser is the language. Ludwig substitutes for agglutination, therefore, the theory of adaptation. Verbal endings are not from pronouns; no personal endings existed; before the verb was the indefinite infinitive used for any person, any tense, and both imperative or indicative in meaning; suffixes acquired definite implication by a gradual adaptation of special meanings, having originally only a demonstrative sense. While containing much truth, this adaptation theory is too exaggerated to be acceptable as a working hypothesis. Another theory, that of Scherer, regards endings of stems of verbs and nouns as indicating a locative sense, while Benfey traced all endings from *anti* (believing that nouns are from verbs); but the two latter views are too fantastic to be discussed.

Forms of Nouns. The same word is noun and verb in its most primitive form, as Sanskrit *dāti*, 'a giving' or 'he gives.' Nouns had seven cases, perhaps more, in Indo-European. The same case had different endings, but, on the other hand, it is most likely, despite the fact that this seems to point to other cases, that, had such cases existed, some traces would have been preserved. Different endings may gradually have become restricted in application, and, as in the case of the Greek dative, different functions may have been absorbed by one ending, tending to a loss of another ending. The seven cases have endings more or less uniform, but apart from modifications caused by the form of the stem, some cases are compounds of two case-endings and some cases show different forms according as a word is declined as noun or pronoun. The seven cases are nominative, accusative, instrumental, dative, genitive, ablative, locative. They are found in the singular, dual, and plural, but except for the nominative and accusative dual in *āu* (*dv-āu*, *duo*) the dual endings are not identical in the different languages and are omitted here. The vocative is not a case, but the bare stem in weak form. An apparent ending in the *o*-stems is only a vowel-weakening. The chief endings are:

Nom. sg., *s*, *m*; pl., *os* (*es*), (*o*)*i*, [*ā*].
Acc. sg., *m*, *d*; pl., *ms*, *ā*.
Instr. sg., *e*, *a*, *bhi* (*mi*), *na*; pl., *bhis*, *o-i-s*.
Dat. sg., (*ai*), *e*, *bhya*(*m*); pl., *bhyas*.
Gen. sg., (*o*)*s*, *sia*; pl., *om* (*ām*), *sām*.
Abl. sg., [*os*], (*a*)*t*; pl., *bhyas*.
Loc. sg., *i*; pl., *su* (*si*).

The ablative is lacking in the singular, except in a few nouns and pronouns, and in the plural, borrowing the forms of the genitive singular and dative plural. The plural *os* (*as*) is the noun-ending in Sanskrit; *ai* (*oi*) the pronoun ending in Sanskrit and Osean and the noun ending in Slavic, Greek, Latin, Celtic, and Gothic. As plural signs serve both *i* and *s*, the latter being added to the nominative, accusative, instrumental, and dative. Some endings were independent words, e.g., *i*, *u*, *a*, *āt*, and Sanskrit still has cases made by adding *ā* to *ē*. Adjectives have noun endings (with some restrictions). The comparative *tara* means 'farther' (also *ias*, *ios*). The superlative, *tata*, *tama*, and *ishta*, is not clear. Numerals have essentially the same form in Indo-European, *ai-ka* (*oinas*), *duā*, *tu*, *śatam-centum*, up to Χιλιοι = (*sa*)*hasra*, though the latter identification is doubtful, and in any case may mean 'heap,' or large number, rather than a definite thousand. The duodecimal system is clearly marked in Sanskrit higher numbers alongside of the decimal system (see above). Participles are part of the noun-system and the stems end in *ta*, *na*, *m*(*ā*)*na* in Sanskrit, Avestan, Greek, and Latin. Prepositions (adverbs) may have case-endings, e.g. παρα-*ί*, παρά, πρόσω.

Forms of Verbs. The Indo-European languages had four tenses, present (imperfect), aorist, perfect, future, and four modes, indicative, subjunctive, optative, and imperative. Only the first three tenses are pure, the future being modal (will), and consequently the future is found only in the indicative, with rare (Vedic) and late (Greek) exceptions. There are two voices, active and middle, the latter serving originally as a passive as well. Secondary conjugations of the pro-ethnic period are numerous. The most clearly defined are causative, denominative, intensive, desiderative, and inchoative. Sanskrit further invented a passive class, and Latin

and Celtic had a special passive voice, while Greek and Sanskrit converted certain aorist forms into passives. There are three numbers, but the dual is weak and even in the oldest Vedic and Greek interchanges with the plural, being lost in Celtic and Latin (save for the ending *-tis*), though preserved in Gothic and Balto-Slavic. Verbal endings are primary and secondary (present and preterite); special endings occur in the perfect. Omitting the dual, these endings in Sanskrit, which has preserved them most fully, are in the active singular, 1, *mi, a;* 2, *si, tha;* 3, *ti, a;* plural, 1, *mas ma;* 2, *tha, a;* 3, *a(n)ti, us;* while the middle changes *i* to *ē* and *mas, tha,* to *mahē, dhvē,* and the preterite tenses drop the final vowel and have *mahi, dhvam,* for *mahē, dhvē.* The preterites and the perfect have also certain *r*-forms, *ram, rē,* etc., like the Latin passive. The present stem is divided into many classes, of which ten are recognized by native Sanskrit grammarians. Including secondary conjugations, the Indo-European languages had in all thirty-two ways of varying the stem by infixes, suffixes, and changing the vowel of the root. Many of these verbal stems coincide with nominal stems. They appear originally to have indicated modified forms of action. The aorist stem is formed either by reduplication, like the perfect, or by inserting an *s*-element, like the future, or it may be differentiated from the present class merely by the vowel or by an ending (*βῆ, βάσκω*). The future has primary endings, but in Sanskrit may be augmented with preterite endings, making a conditional. The subjunctive and optative have different formative elements and their endings are originally the primary and secondary, respectively (see below), while the imperative has preterite endings modified, or special forms. It has no modal sign. In some classes of verbs the subjunctive form coincides with the indicative. Hence *ā*, the subjunctive modal sign, Greek *η*, is not locative, as Scherer taught, but probably due to analogy. The optative sign is *ia* when accented, *i* when unaccented, as shown by J. Schmidt; whence *i* is probably a reduction from *ia* (compare *yā*, 'go,' though this derivation is not favored by Schmidt).

As to the personal endings, with the exception of the third plural (and the dual), Delbrück thinks that they are connected with the personal pronouns, but if so they must go back to a period when they were more deictic than pronominal. The singular affixes *mi, si, ti* have been explained (not very convincingly) both as taken from the pronouns and as having originated the pronouns; but the plural *anti* is probably connected with the participle, the *i* being explained by Ascoli and Brugmann as due to analogy with *ti* (a locative in Scherer's opinion). This finite verbal form would then be analogous to *amamini* (also a participle). The middle endings have been explained as strengthened forms. In Sanskrit the only original strongest form is *āi* (*sāi* and *tāi* being later), a still stronger form of *ē*, which lends color to this (still doubtful) suggestion. Verbal stems were originally not connected with prepositions (most of which are adverbs); hence Latin compound verbs are later than Greek and Sanskrit, and 'tmesis' in the latter is really the older form. New forms have been developed in the separate language, e.g. aorist passives, the future optative and future infinitive in Greek; a third singular preterite aorist passive and a complete *ya*-passive in Sanskrit; *r*-passive and *bo*-future in Latin and Celtic. Greek, like Sanskrit, is older than Latin in having fuller endings, a middle voice, and an augment. The other Indo-European languages have later verbal forms. The augment may have had a short and a long form, *ε*, *η*, and survived in Sanskrit, Persian, and Greek, with traces in Avestan.

Syntax. Only the chief points can be noticed here. First, as to the syntax of nouns: The old distinction between grammatical and non-grammatical cases cannot be maintained. The nominative designates the active, the accusative the passive relation. The latter is both an object of a verb and an object of thought, *this day, me miserum*, non-verbal objectifications. With space and time the accusative is still a veiled object-case. The instrumental shows accompaniment, means, limit; the dative, 'to' or 'for;' the genitive, any adjectival relation, 'of,' 'belonging to;' the ablative, source and means, 'from,' 'by;' the locative, place or time, 'in,' 'at,' 'within.' The syntactical method of Delbrück assigns to each case a certain narrow function; as either 'in' or 'within' (but not both) to the original locative; 'to' or 'for' (but not both) to the dative, etc. But each (pure) case originally contained in itself all that is ascribed to it; the dative from the beginning was a 'to' and a 'for' case; the locative expressed both 'at,' 'in,' and 'within.' The instrumental survives in adverbial form in Greek, but the Greek dative singular is a locative. The genitive in *sia* is an adjective stem like that of the pronouns, *asmāka(m)*, *uostrum, nostri*, which explains in part the syntax of the case. So the Latin *ī*-genitive may be adjectival (preserved in other Italic dialects instead of changing to *oi* or *ei*, which would be the locative form). Other genitive syntax is explained as being due to a sort of adjective-compound effect, in that the sign *as* (*os*) is probably only a nominative affected by sentence accent. So *s* is the sign of the nominative as well as of the genitive. The ablative was probably confined at first to the singular pronoun, where it seems to be from an adverbial affix. Such syntactical growths are common, prepositions (adverbs) being affixed also to completed endings to emphasize the meaning, as *in* is added to the Italic locative, *ā* to the Avestan locative, or *i* to the Latin feminine nominative, *qua-i* (*quar*). In the last case the meaning is probably only emphatic, just as in English *yes-sir-ee, indeed-y*. The nominative *s* has been associated with the demonstrative pronoun. The *m* of the accusative is identical with the *m* of *abam, idam, ἑ-γών, idem*, though what shade of meaning it may have had is as impossible to explain, as is the pseudo-ending of the German *mich*. The neuter nominative in *m* has been explained as borrowed from the nominative, on the ground that neuters were originally not subjects of verbs; but this is improbable.

In verbs present tense-stem connotes durative time; the aorist, unrestricted time, either inchoative or resultant; the perfect, repeated present (inchoative or intensive); the future, modally affected future (will). The subjunctive gives the idea of the unrestricted indicative with the addition of a shall or will element (time and mode); the optative expresses

should or might; the imperative, a command. The aorist may be present or preterite in time and differs from the present-stem meaning only in its quality, since it does not express continued or durative time. Thus Sanskrit *gacchati*, present, is 'he continues a-going,' but *gāti*, aorist, is 'he goes.' The present may thus do duty for a future, as in Gothic. The verbal stem being coincident with the noun-stem, the sense of *bharati* is really 'a bearing, that' or 'he is a bearing,' rather than 'is a bearer.' The reduplication of the perfect connects it with the reduplicated present, desiderative, and intensive forms, and in its first application it connotes present time, afterwards extended to past time, perhaps helped thereto by the pluperfect (with augment), which in Sanskrit is not so much a pluperfect as a reduplicated aorist. The tense of narrative was originally the imperfect, not the aorist. The syntax of the Greek aorist is complicated by the confusion of aorist and imperfect forms. In Sanskrit, future (will and pure future) and optative complement each other and eventually suppress the subjunctive altogether.

The subjunctive, as already stated, has originally primary, the optative secondary endings; but in Sanskrit the former has taken some secondary endings, and in Greek the latter some primary endings. These endings are significant. The optative goes with the imperative and injunctive, modes of wish and command; the subjunctive with the future, shall and may. Delbrück believes that the subjunctive originally expressed will, the optative wish. But his categorical system of syntax is unable to explain the potential sense of the optative and the future sense of the subjunctive. The subjunctive originally connoted a vague shall-will, at the pleasure of the speaker. The primitive subjunctives, ἔδομαι, *ero*, are, in fact, simple futures. So the optative expressed both should and might. In Latin the subjunctive is partly optative. The Homeric subjunctive is later limited to half of its functions. Sanskrit has a distinct precative optative to express wish. Here, as elsewhere in grammar, linguistic machinery of a rough sort was slowly adapted to growing needs, and many shades of meaning were expressed under one form. Vulgar English shows continually how people without discrimination get along very comfortably with the same tense and mode and ending for many situations. In regard to the imperative, which has secondary endings, it was originally used only in the present and for commands, not for prohibitions. Hence μή is used with the subjunctive aorist, and later with the present imperfect only as an extension. So a subordinate negative clause takes μή, as ὅς μὴ ἔλθῃ, 'shall not come'). Thence the use was extended (οὐμή with indicative). Some scholars claim that the optative was originally potential, for the pure optative is used with οὐ, not with μή (for wish). It is worth noticing, in connection with the Greek secondary endings, that when used without augment they may always indicate a command, as in the Sanskrit injunctive, which is an unaugmented preterite.

The determination of the meaning of cases, of tenses, and of moods does not exhaust the store of syntactical problems upon which light has been thrown by comparative philology; but these are the most important aspects and they show sufficiently what has been accomplished. The discovery of new cases (instrumental and locative) in Sanskrit, not recognized in the classical languages, laid the basis for a thorough treatment of case-relations; as the discovery of the injunctive and the Vedic values of subjunctive, optative, aorist, and perfect first clarified the problems connected with the verb.

Modern Tendencies. A typical example of the relation between the stages of growth in the study of philology is given by etymology (q.v.). Before Pott there was an utter want of scientific method. Pott opposed this looseness. Curtius again opposed Pott for thirty years on the ground that Pott was not strict enough. The "young grammarians" in their turn attacked Curtius because he refused to admit that phonetic law is irrefragable.

More recent studies have made etymology much stricter still. To cite a famous example, of all the parallels in the names of Greek and Hindu gods utilized by Müller in his mythological studies, only one case, Dyaus-Zeus, is now regarded as certain. On the other hand, in the question of irrefragable phonetic law, the modern tendency has been to claim that the new school went too far. Bechtel, in 1892, and since then other scholars have questioned the validity of the shibboleth of 'changeless law.' Other doubts have arisen in the last decade on other fields. Stress accent has been replaced in part by musical accent in importance. Schmidt's wave theory has been modified. Semitic influence, as shown in numbers, has been replaced by a putative Dravidian influence, but this matter is unsettled. In geography, Lycian and Carian have been definitively removed from the field of the Indo-European languages. The importance and antiquity of Pali (q.v.) has been brought to the fore. The possibility of reconstructing a 'parent language' has been rendered quite doubtful. Syntax has virtually been built up by one great German scholar, Delbrück. It was the latest task of philology. Naturally the principles thus swiftly built into a system by one man are open to revision. Signs are apparent that the categorical method hitherto employed has ceased to be useful in helping to discover the genesis of syntactical change. Delbrück himself has admitted that his results are founded chiefly on subjective impression. Other scholars question, not the value of the facts amassed by Delbrück, but their interpretation, in criticism that began with Whitney and has tacitly been accepted by Brugmann, Speyer, and other interpreters of syntactical data. In like manner the motive of phonetic change as explained by Delbrück has recently been attacked by Wundt, Meyer, and Oertel, who have respectively sought to show that phonetic change depends largely on ease (or speed), strength of expiration, and geographical environment.

But besides laying stress on new points of view of minor importance, such as haplography, philology has recently brought to the fore one principle and elevated it into the dignity of a new branch of the study under the name of semasiology (q.v.). In 1897 Bréal published his *Essai de sémantique*, which organized into a systematic whole, under different categories, transfers of meaning in the evolution of words. Contiguity, resemblance, and contrast were shown to cause changes of meaning. Our word 'pike' for 'road,' for example, arose from 'turnpike road,' with a gradual reduction of the

phrase to its most characteristic element (the pike or pole which turned the stile at a toll-gate) to represent the whole.

BIBLIOGRAPHY. Brugmann and Osthoff, *Morphologische Untersuchungen* (Leipzig, 1890); Brugmann and Delbrück, *Grundriss der vergleichenden Sprachwissenschaft* (Strassburg, 1886-1900); Curtius, *Grundzüge der griechischen Etymologie* (Leipzig, 1879); id., *Kritik der neueren Sprachwissenschaft* (ib., 1885); Fick, *Vergleichendes Wörterbuch der indogermanischen Sprachen* (4th ed., vols. i. and ii., Göttingen, 1891-94); Leskien, *Die Declination im Slavischen, Litauischen und Germanischen* (Leipzig, 1876); Ludwig, *Agglutination oder Adaption* (Prague, 1879); Paul, *Prinzipien der Sprachgeschichte* (3d ed., Halle, 1898); Delbrück, *Syntaktische Forschungen* (ib., 1871-88); J. Schmidt, *Pluralbildungen der indogermanischen Neutra* (Weimar, 1889); Schrader, *Sprachvergleichung und Urgeschichte* (Jena, 1890); id., *Reallexikon der indogermanischen Alterthumskunde* (Strassburg, 1901); Max Müller, *Lectures on the Science of Language* (revised ed., New York, 1891); Whitney, *Life and Growth of Language* (ib., 1875). For the history of the study, consult: Benfey, *Geschichte der Sprachwissenschaft* (Munich, 1869); Steinthal, *Geschichte der Sprachwissenschaft bei den Griechen und Römern* (2d ed., Berlin, 1889); Delbrück, *Einleitung in das Sprachstudium* (3d ed., Leipzig, 1893); Wheeler, *Introduction to the Study of the History of Language* (New York, 1890). Excellent manuals are: Henry, *Précis de grammaire comparée* (Paris, 1888); Brugmann, *Griechische Grammatik*; Stolz, *Lateinische Grammatik*; Schmalz, *Lateinische Syntax* (the last three in Müller, *Handbuch der klassischen Alterthums-Wissenschaft* (3d ed., Munich, 1900). Consult also: Wackernagel, *Altindische Grammatik* (Göttingen, 1896, incomplete); Speyer, *Sanskrit Syntax* (Leyden, 1896); Franke, *Pali und Sanskrit* (Strassburg, 1902); Gray, *Indo-Iranian Phonology* (New York, 1902); Pischel, *Grammatik der Prakrit-Sprachen* (Strassburg, 1900); Bréal, *Essai de sémantique* (Paris, 1897; translated with an introduction by Postgate, London, 1900); Van Wijk, *Der nominale Genitiv-Singular* (Leipzig, 1902); Knudtson, *Die zwei Vasaa-Briefe* (ib., 1902); Wechsler, *Gibt es Lautgesetze?* (Halle, 1900); Wundt, *Völkerpsychologie* (Leipzig, 1900); Morris, *On Principles and Method in Syntax* (New York, 1901); Oertel, *Lectures on the Study of Language* (ib., 1901); Delbrück, *Grundfragen der Sprachforschung* (Strassburg, 1901); Wundt, *Sprachgeschichte und Sprachpsychologie* (Leipzig, 1901); a reply to the last, Delbrück, *Das Wesen der Lautgesetze* (ib., 1902); and Meillet, *Introduction à l'étude des langues indo-européennes* (Paris, 1903).

PHIL'OMEL (Lat. *philomela*, from Gk. φιλομήλα, nightingale, from φιλεῖν, *philein*, to love + μέλος, *melos*, melody). A nightingale, especially the Persian one. *See* NIGHTINGALE.

PHIL'OME'LA (Lat., from Gk. Φιλομήλη). In Greek mythology, a daughter of Pandion, King of Athens, and sister of Procne. In reward for assistance rendered, Pandion gave Procne as wife to Tereus, King of Thrace, who became by her father of Itys. He then dishonored Philomela, pretending that Procne was dead, and to prevent her from telling her wrong cut out her tongue. Philomela, however, by weaving words in a robe, revealed the truth to Procne, who, to punish her husband, killed her son and served him up to Tereus. The sisters then fled, but, being pursued by Tereus, were changed into birds; Procne and Philomela to swallows or nightingales, while Tereus became a hoopoe or hawk.

PHILOMELA, THE LADY FITZWATERS' NIGHTINGALE. A romance by Robert Greene (1592). It is founded on an Italian story of jealousy, perhaps *Tito and Gisippo* in the *Decameron*. Philip charges a friend, Lutesio, to test his wife by tempting her. Though innocent, Philomela is divorced and flees to Palermo, where her repentant husband discovers her, but his joy is so great that he chokes and dies.

PHIL'OPŒ'MEN (Lat., from Gk. Φιλοποίμην, *Philopoimēn*) (B.C. 252-183). The most illustrious statesman and general of Greece in the period of her decline, the great object of whose life was to establish the independence of his country on a firm and lasting basis. He was born at Megalopolis, in Arcadia, of a noble family. At an early age he lost his father, and was brought up by a wealthy citizen of Mantinea named Cleander, who secured for him a careful education. He received instruction from the academic philosophers Ecdemus and Demophanes. His first experience in warfare was gained in the border raids which took place between the Arcadians and Laconians, and in B.C. 222 he with a few others defended Megalopolis against the attack of the Spartan King, Cleomenes. In the following year, when the Macedonian King Antigonus came to the assistance of the Achæans, Philopœmen joined him at the head of a band of horse, and distinguished himself in the battle of Sellasia (B.C. 221), in which the power of Sparta was completely broken. Philopœmen now went to Crete, where he lived for several years; on his return in 210 he was appointed commander of the Achæan horse, and in the expedition of 209 against Elis distinguished himself for his bravery, slaying with his own hand the Elean leader, Demophantus. In 208 he was chosen strategus or commander-in-chief of the Achæan League, a position which he held eight times in all. He at once proceeded to introduce reforms into the discipline and armor of the soldiers, and soon, by these means and by his personal influence, made the army a most effective instrument of war. In 207 he utterly defeated the Spartans under Machanidas, and at the Nemean festival which followed he was proclaimed liberator of Greece. In 201 he defeated Nabis, who had succeeded Machanidas as tyrant of Sparta, and soon afterwards made another voyage to Crete. Returning to the Peloponnesus in 194, he was appointed strategus in 192, and again defeated Nabis. Shortly after he compelled Sparta to enter the Achæan League, and when she revolted in 188 he took the town, razed the walls, and compelled her to adopt the Achæan laws. He was in his seventieth year and sick in bed when news was brought him that the Messenians had revolted from the League; he immediately left his bed and took command of the army. In the battle that ensued he was taken prisoner, and Deinocrates, the Messenian commander, sent him a cup of poisoned wine, which he drank. Consult: Plutarch's *Life of Philo-*

pedia). Freeman, *History of Federal Government in Greece and Italy* (2d ed., London and New York, 1893); Mahaffy, *Alexander's Empire* (New York, 1888).

PHILOSOPHER OF FERNEY. A title given to Voltaire, from his Swiss residence.

PHILOSOPHER OF MALMESBURY. A title conferred on Thomas Hobbes, from the name of his birthplace.

PHILOSOPHER OF SANS-SOUCI, sän sōō'sē'. A title applied to Frederick the Great.

PHILOSOPHER OF WIMBLEDON. A name used of John Horne Tooke, from his residence in Surrey.

PHILOSOPHER'S STONE, The. A mysterious compound to which was attributed the power of transmuting metals into gold or silver, and the attempted making of which was the chief occupation of alchemists, at least during the Middle Ages. In reality it bore no resemblance to a stone, being more properly described as an amalgam. It was a universal panacea that was so eagerly sought, for with the function of a universal solvent it combined that of the elixir of life, a renewing influence on the body. The conception of the transmutation of metals was Oriental. The Arabs regarded metals as compounded of mercury and sulphur in varying proportions. To this was added a more philosophic conception of a common basis of all forms of matter, individual forms being due to a force separable from this. If the 'materia prima' could be dissolved from the combining forces and united with the special 'form' of gold and the combination could be controlled, then any bodies could be produced at will. Three forms of the philosopher's stone are mentioned: the great elixir, a red tincture transmuting metals into gold; the elixir vitæ, restoring youth and prolonging life; and the lesser elixir, a white tincture, changing metals into silver. The powers of the philosopher's stone appear to have been first described by Zosimus in the fifth century. Geber (q.v.) was the reputed author of the *Key of Wisdom*, a secret book on the philosopher's stone. The matter was generally shrouded in mystery and not clearly defined until the twelfth century. Salt, sulphur, and mercury, regarded as the elements of matter, were combined to produce the solvent. By the sixteenth century the formula of preparation had become more definite. The 'mercury of philosophy,' combined with gold, was placed in a furnace where the gold was dissolved. After a long interval a black powder, called Saturn, was produced. A further heating produced the white tincture, or little philosopher's stone, and a hotter fire produced a red powder, the true stone. Van Helmont asserted that he had seen and handled the stone, which was sulphur color, heavy, and brilliant as glass. Paracelsus described it as a solid of deep ruby color, transparent, flexible, and brittle as glass; Raymond Lully, as a carbuncle. After the thirteenth century a mystic and esoteric interpretation of the philosopher's stone seems to have been applied to metals, the stone bringing to the wearer wisdom and virtue, and purifying the soul.

PHILOSOPHICAL SOCIETY, American. The oldest of American learned societies. Its official name is the American Philosophical Society, Held at Philadelphia for Promoting Useful Knowledge. Its hall is No. 104 South Fifth Street, Philadelphia, in which are meeting and banquet rooms, an extensive and valuable library, many interesting portraits and busts, one of the latter being Houdon's Franklin, and a collection of relics, including the chair used by Jefferson while writing the Declaration of Independence. In 1893 the society celebrated the sesqui-centenary of its beginning, for on May 14, 1743, Benjamin Franklin published in Philadelphia "A Proposal for Promoting Useful Knowledge among the British Plantations in America," and though his suggestions were not acted upon immediately, he wrote on April 5, 1744, that the society had been formed and had held several meetings, with Thomas Hopkinson as president and himself as secretary. Within a few years regular meetings were discontinued, though before 1758 another society was started in Philadelphia, called the Junto, or Society for the Promotion of Useful Knowledge, which also languished until April 25, 1766, when it was revived, with thirty members, as the American Society for Promoting and Propagating Useful Knowledge. The earlier society renewed its activity in November, 1767, and the union of the two was suggested, but a year was spent in negotiation before the two became one on January 2, 1769, adopting the present name and electing Benjamin Franklin president. He held this office until his death in 1790. The second president was David Rittenhouse, the astronomer and the first director of the United States Mint, and he was succeeded by Thomas Jefferson. In 1785 John Hyacinthe de Magellan, of London, presented two hundred guineas to the society for a perpetual fund, the interest each year to be put into a gold medal, to be given to the author of the best discovery or improvement in navigation, natural history, or astronomy. The Magellanic fund has always been kept as a separate investment, and its medal is considered one of the great honors in the scientific world. Membership in the society is limited to those who are invited to join on account of their contributions to science and knowledge; consequently the honor of an election is highly prized by American scientists. In recent years the society has established a series of annual meetings, to which distinguished men of science of Europe are invited, and these assemblages have become events of international interest. The published *Transactions* of the society begin with 1771, in which year a copy was given to each member of the General Assembly of Pennsylvania, with the statement that "the volume is wholly American in composition, printing, and paper." The society also publishes *Proceedings*, beginning in 1838, issuing them in about two hundred parts, making over forty volumes.

PHILOSOPHY (Lat. *philosophia*, from Gk. φιλοσοφία, love of knowledge, from φιλεῖν, *philein*, to love + σοφία, *sophia*, wisdom, from σοφός, *sophos*, wise). A term originally used, e.g. by Socrates, to mean devotion to the pursuit of truth. In Plato it came to mean knowledge of eternal reality. Aristotle employed the term sometimes as equivalent to critical systematized knowledge, sometimes as meaning the science of ultimate reality. The Stoics considered philosophy to be the endeavor to obtain excellence

(ἀρετή, *aretē*) in knowledge and in morality; the Epicureans regarded the philosopher as the man who pursued happiness in the manner suggested by reason. In the Middle Ages philosophy came to be ancillary to theology, and in large measure the reasoned defense of divinely revealed truth. In modern times various definitions have been given, such as "rational knowledge derived from concepts as such" (Kant), "the revision of concepts" (Herbart), "the science of principles" (Ueberweg), "the totality (*Inbegriff*) of all scientific knowledge" (Paulsen), and "the reduction of the general knowledge obtained by the special sciences to a complete system" (Wundt); while some thinkers have despaired of the possibility of finding any definition that shall cover the whole field historically occupied by philosophical speculation. The conception of the task of philosophy necessarily changes with the course of time. At the beginning, before any special sciences had arisen, it was natural that the unity of knowledge should be insisted on, and that the student should ambitiously take all knowledge for his province. But the scope of philosophy has gradually grown narrower as its original domain has been encroached upon by new sciences. The failure of philosophers of the present to agree on the definition of their work is due to the fact that so much territory has been already occupied by these sciences as to leave the proper domain of philosophy in doubt. These sciences have one and all been experiential in their method. To those who believe in the existence of *a priori* knowledge, a point of departure for delimiting philosophy from science is obtained in this distinction of the inductive from the deductive. But the belief in *a priori* knowledge is less current than it was a hundred years ago, and some other differentiation of philosophy from science must be undertaken by the inductivist. Perhaps no better plan can be adopted than that based upon the specialistic character of present-day science. Each science pursues its own investigations in its own limited field, and will allow itself to be prejudiced as little as possible by what is done in other fields. But after all it is the same universe that furnishes object-matter to all the separate sciences, and one would naturally expect that all the separate knowledges gained by specialists would articulate themselves into a coherent system of knowledge. The hope to accomplish this articulation in detail would be idle; but every science has its concepts, which it uses to organize the facts in its own little field. Do all the concepts tally? Are they compatible with each other? Questions of this sort are reasonable, and an attempt to answer them forms the so-called philosophy of nature, which may be defined as the correlation and criticism of scientific concepts. Among such concepts are those of matter, energy and its conservation, atom, life, evolution, differential, point, line, etc. The philosophy of nature is without doubt the most difficult branch of philosophy, as it demands for its prosecution considerable familiarity with the leading sciences. But while it is not to be hoped that any very general treatment of the subject can be satisfactory, still more detailed work in the way of correlation and criticism of the conceptions employed in a few sciences can be reasonably expected. Such work has been done in English by Stallo in his *Concepts and Theories of Modern Physics* (London, 1882), and by James Ward in his *Naturalism and Agnosticism* (London, 1899).

Again, all the sciences take for granted that man can know something about the universe. What is this knowledge? Is it really valid, as it claims to be? Is there any way of ascertaining its validity? A scientific treatment of these questions is called epistemology, or the theory of knowledge (q.v.), and forms a second philosophical discipline. Still again, can any light be thrown on the ultimate nature of the reality either of the external world or of the mind? This is the problem of metaphysics (q.v.). Formerly logic, psychology, and ethics were considered as branches of philosophy, but the modern tendency is to establish them as separate sciences. This is accomplished, however, only in a restricted sense. At bottom the question whether this or that discipline is a science or a branch of philosophy is of no great importance, when it is recognized that there is no fundamental difference in method between science and philosophy, the only difference being one of degree, not of kind. The more abstract any systematic knowledge is, the narrower the field it appropriates to itself; the more it neglects other subjects lying outside of that field, so much the more properly is it called a special science. On the contrary, the more comprehensive such knowledge is, the more philosophical it is: for philosophy is an attempt as far as possible to know the world as a whole.

History. The history of European philosophy is commonly divided into three main epochs, each characterized by a unique development, although at the same time the earlier periods furnish preface and starting-point for those which succeed them, so that the whole development is continuous. The first of these periods is that of ancient or Greek philosophy (q.v.). It extends from the earliest formulations of philosophic conceptions among the Ionian philosophers and continues into the Christian Era, throughout the dominance of paganism. While shared by other nations of antiquity besides the Greeks, as notably by certain Romans, Jews, and Græco-Egyptians, it received its form and lasting bent from the Greek mind, and its later influence proceeds almost exclusively from Athenian culture. The second period is that of mediæval philosophy, or scholasticism (q.v.). It had its rise in the theological speculations of the early Church Fathers, usually educated in Greek thought, and was continued and developed throughout mediæval times as the characteristic philosophy of Catholic Christianity. It had its culmination in the great synthesis of Thomas Aquinas, but has never ceased to be the traditional philosophy of the Church, and in modern times, as neo-scholasticism, is the subject of an energetic revival. During the scholastic period in Christian Europe the tradition of Greek philosophy was kept alive by the Arabs in Spain (see Arabic Language and Literature), among whom were many important philosophical thinkers. The third period is known as the period of modern philosophy, and is commonly dated from the Renaissance (q.v.), and more particularly from the advocacy of empirical methods of investigation by Bacon and of appeal to immediate reason or intuition by Descartes.

With the revival of learning there was also a

revival of all the important philosophical systems of antiquity. Platonism flourished in the Academy of Florence and found its most important advocate in Ficino. Neo-Platonism blended with Neo-Pythagoreanism which was represented by Pico della Mirandola. Aristotelianism renewed its vigor in the two rival schools of Averroism and Alexandrism, and among the Protestants in Melanchthon. Skepticism was defended by Montaigne, Sanchez, and Charron; eclecticism, virulent in its opposition to scholasticism, was propagated by Valla, Vives, de la Ramée, and Zwingli, while scholasticism found its champion in Suarez. Natural philosophy, a rehabilitation of one phase of Aristotle's system, but blended with Neo-Platonic mysticism, was developed by Cardano, Campanella, and especially by Bruno. Paracelsus and Böhme elaborated the mystical side of this line of thought, while Galileo and Kepler remained more true to an empirical study of nature, and formed the starting point of a mechanistic and materialistic conception of the universe. In Kepler, however, with his insistence on the harmony of the world order, we have a distinctively Pythagorean touch. Political philosophy took an entirely new start with Machiavelli, who threw aside the work of Aristotle and the authority of the Church, and worked out an anti-moral theory in which the State and civic freedom were all-important. But though the philosophers of the Renaissance thus bridged over the chasm that separated the ancient from the modern world of thought, it was reserved for Bacon and Descartes to lay the foundations of modern philosophy in empiricism on the one hand and in rationalism on the other; and the real problem of modern philosophy has been to rear a superstructure which should rest on both these foundations. As was to be expected, the foundations had first to be laid independently, and as a result we have two great modern schools, each equally one-sided, but each equally standing for a fundamental truth—the one, the truth that all secure knowledge rests on experience; the other, the truth that in all satisfactory knowledge the demands of reason are met.

Modern empiricism came to articulate expression first in Francis Bacon, who insisted upon the abandonment of the deductive, *a priori* speculation of the schoolmen, and on the necessity of studying nature without bias. Hobbes followed Bacon in urging the necessity of a philosophy of experience; but being especially interested in human nature, and yet lacking the data for an inductive study of society, he allowed himself to construct society out of imaginary isolated human beings and to palm off this fiction for fact.

Modern rationalism began with Descartes, who is often called the father of modern philosophy. He likewise emphasized the necessity of beginning anew, but, unlike Bacon, he looked to the inner nature of self-consciousness for the principles that can build up the structure and furnish the certainty of knowledge. The Cartesian system is rationalistic; the method for advancing our knowledge was thought to consist in letting the light of reason shine forth. This was accomplished by the application of mathematical method to metaphysics, with the result of bringing out the innate truths and principles of reason. In this way we become assured, Descartes argued, of our own existence, of the existence of God, and of that of the material universe. Descartes sharply separated mind and matter; mind is thinking, unextended substance; matter is unconscious, extended substance. Two great problems are therefore handed down to his immediate followers. What is the relation between mind and matter in general, and the soul and body in particular? And what is the relation between the soul and God? Geulincx, the founder of Occasionalism (q.v.), answers the former question by saying that God acts in the individual, intervening on each occasion, to maintain the parallel between mind and body. God is the real subject of human acts, the individual being but a nominal subject. The second problem is taken up by Malebranche, who maintains that God thinks in the individual. The individual is nothing but the mode of God's being. The mind is in God, and in Him views everything in its eternal significance. Spinoza carries out Cartesianism to its logical conclusion. Substance is that which exists independently. Hence the infinite alone, God, is true substance. Mind and matter are two attributes of the one divine substance. They are known to us as the parallel manifestations of the hidden substantial identity in God. Spinoza develops his system by pure deductive reasoning, following the procedure of geometrical demonstrations. He thus exhibits the ideal method of rationalism, which regards reason, working solely on its own inner principles, as capable of discovering the true nature of reality. The moral and physical parts of the universe follow from these principles with the same rigid necessity as the *demonstranda* of geometry follow from its axioms. Joyful resignation to this rationalistic determinism is the essence of morality. Spinozism reduces the dualism of mind and matter to a common principle and results in pantheistic monism (q.v.). Leibnitz endeavors to solve the paradox of Spinozism that unextended and extended substances are ultimately identical. As a rationalist he sides with Spinoza; as an individualist he sides with Locke. Leibnitz's substance is not that which *exists* through itself, but rather that which *acts* through itself. Reality consists of an infinite number of monads (q.v.), which are unextended, ideal activities, centres of original forces, or *formal* atoms. Each atom is self-contained and cannot be modified from without. Spinoza surrenders the reality of individuals to the principle of unity. This unity Leibnitz breaks up into a plurality of independent, self-active monads. But the multiplicity is synthetized by the Leibnitzian principle of continuity and the law of preëstablished harmony (q.v.). All the monads belong to an organized system, and each mirrors or represents the universe. The individuals are not isolated, but belong to an organic whole. God, the supreme monad, is pure activity, while finite monads are in a state of imperfect realization. They are not completely active. It is the passivity of finite monads that gives rise to confused perceptions, which cause the appearance of an extended, material world. These fundamental principles of Leibnitz's system are sacrificed by his follower, Wolff, who adopted merely the rationalistic method of his master and reduced philosophy once more to scholastic form. This was the culmination of dogmatic rationalism on the Continent.

In the meantime the empiricism begun by Bacon and the rationalism begun by Descartes became curiously intermixed in Locke's theory of knowledge. Locke supported the Baconian appeal to experience. The sole sources of our knowledge are empirical facts, since the mind has no innate ideas. All the materials of knowledge are externally impressed upon the mind, the sole activity of which consists in linking together the given ideas. Upon this sensationalistic basis, however, Locke built up a rationalistic ideal of knowledge. We attain certainty in our intuitive knowledge of the existence of the self, and in the demonstrative knowledge of the existence of God, and of mathematical and moral truths as well. Our knowledge of the external world, being dependent upon sense-perception, reaches only the level of probability. In this, Locke violated his own fundamental principle that our knowledge extends no further than our sensationally given ideas, and that truth consists in the agreement of ideas among themselves, not in their correspondence with things or external reality. Berkeley took Locke's definition of knowledge in a strict sense, and insisted that we never get beyond the circle of our own ideas. We know nothing about the agreement of our subjective ideas with external things. All knowledge, he contended, is purely individual, and all ideas are merely particular. The mistaken belief in the existence of self is due to the confusion of taking an abstract or general name as representative of a real thing. The reality of sense-objects consists in their being perceived. The assumption of an object apart from the idea is as useless as its existence would be. Ideas signify nothing but modifications of the conscious subject. Hume carried empiricism to its inevitable logical consequence. There is nothing knowable, he argued, but conscious experiences—'impressions' and their copies, 'ideas.' These we cannot transcend. They are externally connected by 'gentle forces,' called relations or associations. We cannot prove the existence of God, of the self, or of matter. All these are fictions of the imagination, and have no basis in actual experience. Thus, step by step, empiricism ends in skepticism.

Kant, the founder of the critical philosophy, consciously and critically attempted what Locke had naïvely achieved, the arbitration of the controversy between empiricism and rationalism. His decision was that rationalism is right in its determination of scientific method: empiricism, in limiting scientific knowledge to the sphere of possible experience or phenomena. Knowledge, he maintained, is a joint product of two factors, one furnished by the conscious subject, the other given in the raw material of sensation. The former is *a priori;* it antedates experience and is the condition which makes experience possible. The latter is *a posteriori*, given from without. The *a priori* would be devoid of content without the sensible material; the *a posteriori* would be nothing at all were it not shaped and transfigured in the mold of consciousness. Theoretical reason may not transcend the bounded domain of experience, but practical reason asserts the necessity of the belief in a world of transcendent reality, in which the moral order is the natural law. God, freedom, and immortality, though undemonstrable, are the necessary postulates of our moral being. Thus reason gives way to faith. Fichte, starting from a Kantian basis, objected to Kant's failure to show how the *a priori* principles of consciousness are necessarily involved in the nature of consciousness, as well as to the Kantian separation of the phenomenal world and the real world of things-in-themselves. By exhibiting the process in which consciousness unfolds itself, we see that the phenomenal world is meaningless unless organically connected with its intelligible essence. Knowledge is neither in whole (Hume) nor in part (Kant) the product of sensation. It is the creation of the ego. Voluntary selves freely choose to assert themselves and thus construct their whole organized world. The moral law is the prior condition of all we theoretically know, and the outer world exists simply for the sake of our moral self-realization. The speculative method, the exhibition of the progressive nature of consciousness, is the only possible method, since knowing does not begin with facts passively received by the ego, but with a spontaneous act of the ego's creative energy. Jacobi also objected to the Kantian separation between the thing-in-itself and the phenomenal world. Without the thing-in-itself, he said, no one can enter the Kantian system, and with it no one can remain in that system. The only solution of this antinomy was to exalt faith, to which even Kant had recourse, to the supreme place in philosophy. Not knowledge, but feeling, is the organon whereby we can attain certainty of reality. Thus results a philosophy of supranatural sensualism. Schelling reached much the same result, but by a different method. He regarded the world as the embodiment of intelligence, an objective fact, indeed, but one that exhibits in its progressive forms the same principle that is found in man. But the character of that absolute principle which thus manifests itself in external nature and in man cannot be apprehended by reason. Intuition alone brings us into contact with ultimate reality. In Hegel German rationalism vigorously reasserted itself: the real is the rational and the rational is the real. All reality is but a manifestation of reason. The world is a development of thought. But thought and reason are not abstractions. The word thought is used with a width of meaning that includes in it the concrete content of the world of sense organized into an all-inclusive universe. The life and stir of the universe is the life of thought. The development of this concrete thought is a dialectical development, hence philosophy must employ the dialectical method to exhibit the nature of reality. The motive force of this development is opposition and negation. Everything is what it is by virtue of what it is not; that is, by virtue of its relation to other things. These various things taken apart are self-contradictory; only when seen in their interconnection are they seen to be real. The contradictories are not annulled in their mutual relations; they are conserved, but thus conserved no longer are they contradictory. The tracing of this process of negation is the Hegelian dialectic. With the death of Hegel, Hegelianism broke up into warring schools and became utterly discounted in Germany, only to be resuscitated later in England and America in the so-called Neo-Hegelian School.

Schleiermacher took up the philosophical problem where Fichte, Schelling, and Jacobi had left

it. He agreed with Jacobi that thought cannot grasp the essence of reality; hence philosophy is not a complete science; but while it is not complete, it is ever growing and reaching out toward the goal of the identity of thought and being. This goal, however, can be reached only in religion, the communion of the finite with the infinite upon which it feels itself dependent. In Herbart and Schopenhauer there is a twofold opposition to Hegelianism; the former opposed his doctrine of real qualities to Hegel's idealism; the latter directed his pessimism (q.v.) against the idealistic estimate of the value of existence, and maintained that the real is an irrational principle of blind impulse. Beneke attempted to synthesize the results of previous philosophical activity by developing a psychological philosophy, based on inner experience. Self-consciousness reveals directly to us the psychic constitution of man; sensation is only mediate knowledge of the outer world, which must be interpreted after the analogy of psychic life. Lotze combined the Hegelian and Herbartian positions, while Hartmann aimed at a synthesis of Schopenhauer and Hegel. Among recent German thinkers the cry of "Back to Kant" is especially prominent; this Neo-Kantianism is represented by such men as Lange, Cohen, Volkelt, Riehl, and Paulsen. Another vigorous German school at present is that of the so-called immanent philosophy of Schuppe, Rehmke, and Schubert Soldern, who deny the antithesis of idea and object, and assert an identical unitary consciousness in all beings. The immanent content of this consciousness is the world of space and time. Allied to this immanent philosophy is the empiriocriticism of Avenarius, who, like Schuppe, begins, not with the opposition of subject and object, but with the pure experience of the unsophisticated man free of all preconceived theory. In this experience the so-called object of consciousness is an integral part; and of this experience philosophy is an exact description. Materialism had a temporary revival in the middle of the nineteenth century in Germany; its champions were Vogt, R. Wagner, Moleschott, Büchner, Czolbe, and Dühring. Sometimes identified with materialism is the monism of Haeckel, who, however, is not a materialist, but an animist, holding all matter to be instinct with life; but inasmuch as the material, not the conscious, side of being is emphasized, the doctrine is closely allied to materialism. Fechner had some years before Haeckel advocated an animism, which, however, had emphasized the conscious side of being. Wundt's philosophy is related to Fechner's, inasmuch as he holds that the mechanical universe is "the outer wrapper behind which is hidden a spiritual creative activity, a striving, feeling, sensing, like that which we experience in ourselves." Holding that conation is the most fundamental essence of this activity, his view is voluntaristic.

Returning now to French philosophy, we may say that after the time of Descartes there have been no epoch-making thinkers in France except Rousseau and Comte. Deserving of mention are Bayle, the skeptic; Voltaire, more positive in his attitude and with a leaning toward mechanism; Rousseau, the political philosopher, believing with Hobbes in a state of nature preceding society, but emphasizing the social nature of man, which Hobbes had ignored; La Mettrie and Condillac, sensationalists; La Rochefoucauld and Helvétius, egoists; Bonnet, a rationalistic sensationalist; Diderot and d'Alembert, pantheists. The last three, along with minor thinkers, are known as the Encyclopædists, because of their coöperation in the issue of the great *Encyclopédie*. During the French Revolution the predominant philosophy was sensationalism, going under the name of ideology, given it by Destutt de Tracy. Cabanis emphasized the physiological basis of sensationalism; a little later Maine de Biran, starting with the psychological fact of self-consciousness, reached a view similar to Beneke's, in which the spiritual nature of self-activity received recognition. He was thus the forerunner of spiritualism (q.v.), which was championed by Jouffroy and Royer-Collard, and had in Cousin its most prominent exponent. Spiritualism lived through the nineteenth century, being later represented by Ravaisson, Secrétan, and Vacherot. Opposed to ideology were the traditionalists, who, while reaching spiritualistic results, were hostile to the method of the spiritualists. Accepting the Catholic doctrines as unimpeachable, they emphasized the supremacy of faith above reason. Reason inaugurated the Reformation and issued in the Revolution; it is the source of nothing but evil. Faith resting on inspired authority is alone able to reach the truth. So wrote De Maistre, Frayssinnous, and Bonald. But reason would not down, and turned its attention to the social nature and relations of human beings. Saint-Simon, the founder of the French Socialistic School, was not himself so much a philosopher as a reformer; he practiced rather than theorized; but he interested many speculative minds in social problems. The greatest of his disciples was Auguste Comte. Comte contended that the only true and final philosophy is positive; true philosophy is an accurate description of facts and their experienced relations. He brushed aside all pretence of knowledge of anything more ultimate than the phenomena of experience. Positivism, however, according to Comte, is only the third stage of philosophical reflection. Man's first attitude toward nature was theological; he attempted to explain phenomena by referring them to supernatural powers. Then man became metaphysical, using abstract conceptions, like force, as principles of explanation. Finally as the third stage came positivism, the insight into the futility of previous explanations, and the recognition of facts and their relations as philosophical ultimates. About the middle of the nineteenth century, in protest against Comte, a revival of Platonism occurred in certain Catholic circles; Cartuyvels, Huguin, and Gratry maintained that ideas are modes of God's essence. Positivism passed over into agnosticism in Littré, Taine, and Renan. With the development of experimental psychology a psychological philosophy has been cultivated by Ribot, Delbeuf, and Bernard. After Darwin's *Origin of Species* appeared, evolutionism was eagerly taken up by French thinkers, chief among whom have been Fouillée and Guyau. But Kantian principles maintained their ground in the philosophy of Renouvier and his followers. Lachelier attempted a combination of Kantianism and spiritualism. Against the determinism (q.v.) of positivism, psychologism, and evolutionism, Boutroux advocates a philosophy of contingency and freedom.

Since Bruno's time Italy has made little original contribution to philosophy, although she can boast of many brilliant expositors of already existing systems. Vico and Beccaria can lay the best claim to originality, both working in the realm of the philosophy of law. Genovesi, the empiricist; Galluppi, the sensationalist; Rosmini and Gioberti, objective idealists; Mamiani, a modified Platonist; Vera and Spaventa, Hegelians; Testa and Cantoni, Kantians; Villari and Dominicis, positivists; and Bonavino, Thomist, deserve passing mention.

For the last two centuries Great Britain has shared with Germany the honor of having distinctive national philosophies. English thought has been predominantly empiristic and associationistic until the last half century. Hartley gave associationism (q.v.) its modern form, and James Mill applied it to all the life of mind. John Stuart Mill, best known popularly by his utilitarianism (q.v.), did his greatest philosophic work in logic. True to empiricism, he introduced induction into the place it now occupies in logical theory, and yet he builded better than he knew. His empiricism did not furnish an adequate basis for his logic, and subsequent logicians, as Sigwart in Germany and Bosanquet in England, have succeeded in effecting a reconciliation between empiricism and rationalism in logic; but this they could not have done without Mill's pioneer work. Darwin's great discovery has been extremely fruitful in philosophy. Spencer has worked out an evolutionary philosophy in elaborate detail, but with a strong individualistic bias. It is, however, marred by a lack of historic perspective. Lewes represented positivism; Martineau has been the most prominent advocate of intuitionism (q.v.), applying intuitionistic principles especially to ethics and theology. Green, Bradley, and Bosanquet, under the influence of German idealism, have sought to stem the tide of empiricism. Ward, from a psychological starting-point, has likewise reached an idealistic result. Under the leadership of these men and of the two Cairds, of Scotland, English philosophy has almost left its empiristic moorings.

The typical philosophy of Scotland since the time of Hume has been intuitionism. Hutcheson may be regarded as its founder. Reid and Stewart gave it classical expression. This Scotch thought was a protest against the Lockean doctrine that knowledge is only a correspondence between ideas, and stoutly maintained that we have immediate knowledge of objective reality. Hamilton, in his natural realism, sought to reconcile intuitionism with Kantianism. The two Cairds and Stirling broke away from the intuitionistic tradition and gave Hegelianism a vogue which makes it rival intuitionism in Scotland and empiricism in England.

In America the greatest original philosopher was Jonathan Edwards, who, starting from Lockean premises, elaborated under Calvinistic influences a most uncompromising determinism (q.v.). Franklin, while not technically a philosopher, gave an impetus toward empiricism. Witherspoon and McCosh brought strong support to Scotch intuitionism, also taught by Upham and Wayland. Among the educators who early aroused interest in philosophy were Noah Porter, Mark Hopkins, and Daniel Coit Gilman. Hickok was mildly Kantian; Bowen was eclectic; Bowne and Ladd are Lotzeans. The Concord School of Philosophy, headed by Emerson, popularized German idealism, which has been strongly defended technically by Harris; while Royce and Dewey have given it a more independent and original statement. James is a brilliant advocate of empiricism and seeks to rescue philosophy from agnosticism by asserting the right of a will to believe in face of doubt; and George Stuart Fullerton is a keen critic, whose studies in epistemology are of special importance.

In the last century the significance of the history of philosophy has been brought out by a long line of historians, beginning with Hegel. The result is that the continuity of philosophic development, and the genuine advance made by philosophic thought, in spite of an apparently merely back-and-forth movement, have been appreciated.

BIBLIOGRAPHY. Külpe, *Einleitung in die Philosophie* (2d ed., Leipzig, 1898; Eng. trans., London, 1897); Rogers, *Brief Introduction to Philosophy* (New York, 1899); Ladd, *Introduction to Philosophy* (ib., 1890); Paulsen, *Einleitung in die Philosophie* (4th ed., Berlin, 1896; Eng. trans., New York, 1898); Hibben, *The Problems of Philosophy* (ib., 1898); Wundt, *System der Philosophie* (2d ed., Leipzig, 1897). W. S. Sonnenschein has published *A Bibliography of Philosophy* (London, 1897). For the history of philosophy especially, consult: Schwegler, *Handbook of the History of Philosophy* (Eng. trans., Edinburgh, 1874); id., *A History of Philosophy in Epitome* (Eng. trans., New York, 1888); Erdmann, *History of Philosophy* (Eng. trans., London, 1890); Ueberweg, *History of Philosophy* (Eng. trans., new ed., New York, 1891; the original German work has been frequently revised by Heinze, 8th ed., Berlin, 1896-97); Windelband, *History of Philosophy* (Eng. trans., New York, 1901); Weber, *Histoire de la philosophie européenne* (5th ed., Paris, 1892; Eng. trans., New York, 1897). For the Greek period, especially Zeller, *Die Philosophie der Griechen*, in several volumes, covering separate periods, and separately translated; Burnet, *Early Greek Philosophy* (London, 1892); Ritter and Preller, *Historia Philosophiæ Græcæ* (8th ed., Gotha, 1898). For scholastic philosophy, see the article SCHOLASTICISM. For the more modern developments, Windelband, *Geschichte der neueren Philosophie* (Göttingen, 1898); Fischer, *Geschichte der neueren Philosophie* (4th ed., Heidelberg, 1898-1902); Höffding, *History of Modern Philosophy* (Eng. trans., London, 1900); Royce, *The Spirit of Modern Philosophy* (Boston, 1892); Seth, *From Kant to Hegel* (London, 1892); Falckenberg, *History of Modern Philosophy* (Eng. trans., New York, 1893); also, Blackwood's *Philosophical Classics*, Griggs's *Philosophical Classics*, and Frommann's *Klassiker der Philosophie*. Excellent bibliographies are to be found in Weber's and Ueberweg's histories referred to above.

PHILOSOPHY, MORAL. See ETHICS.

PHILOS'TRATUS (Lat., from Gk. Φιλόστρατος). The name of four sophists of the Roman Imperial period. According to Suidas the first three were all natives of the island of Lemnos. (1) The first PHILOSTRATUS lived in Nero's reign (A.D. 54-68). The only extant work of his is the dia-

logue *Nero*, a conversation between the Lemnian Mnesicrates and the banished philosopher Musonius Rufus on the Emperor's proposed canal across the Isthmus of Corinth and on his great cruelty. (2) FLAVIUS PHILOSTRATUS flourished under Septimius Severus (A.D. 193-211) and his successors. At the request of the Empress Julia Domna, he wrote a remarkable *Life of Apollonius of Tyana*, in which he laid especial stress on the miracles ascribed to this pagan saint. The work was used later to oppose the teachings of the Christians. The same Philostratus is the author of the extant *Lives of the Sophists*, written soon after A.D. 229. (3) The third PHILOSTRATUS, son of Nervianus and son-in-law of Flavius Philostratus, was a young man in the reign of Caracalla (A.D. 211-217). He composed a work entitled *Imagines* (Εἰκόνες), which is still extant and describes 64 paintings in Naples. (4) The last PHILOSTRATUS was a grandson on his mother's side of the third Philostratus. He also wrote an *Imagines*, after the manner of his grandfather's book. This work is inferior to its model, and in its present form breaks off in the description of the seventeenth painting. The *Imagines* of the third Philostratus at least have now been proved to be descriptions of actual works of art, and so are of great value to the archæologist. The dialogue *Heroicus* probably belongs to the third sophist, while the second apparently was the author of the interesting collection of *Letters*. The standard edition of all these works is by Kayser in the Teubner Collection (2 vols., Leipzig, 1849). The *Imagines* of the third Philostratus have been separately edited by the members of the Vienna Classical Seminary (Leipzig, 1893).

PHILO'TAS (Lat., from Gk. Φιλώτας). A Macedonian general. See PARMENION.

PHILOXENIAN VERSION. See BIBLE, section on *Text of the New Testament*.

PHILOX'ENUS (Lat., from Gk. Φιλόξενος) (B.C. 435-380). A famous dithyrambic poet, born in Cythera. When the Spartans recaptured the island from the Athenians, probably after the Sicilian Expedition, he became a slave. Eventually he passed into the hands of the poet Melanippides, who, attracted by his talent, educated and freed him. He lived some time at the court of the elder Dionysius in Syracuse. There he forfeited the tyrant's friendship either on account of his frank criticism of his patron's verses or because of his love for a beautiful flute-player, Galatea, the mistress of Dionysius, and was imprisoned in the quarries. Philoxenus subsequently took vengeance on Dionysius by composing the most famous of his dithyrambs, *The Cyclops*, in which he represented himself as Odysseus winning from the Cyclops the affections of his sweetheart, the nymph Galatea. This was the model for Theocritus's eleventh idyl. After leaving Syracuse, Philoxenus lived at Tarentum, and later in Greece, and died at Ephesus. He wrote 24 dithyrambs in all, which were greatly admired in antiquity. Of these only insignificant fragments remain. The poem entitled *The Banquet* (Δεῖπνον), of which much is extant, is generally ascribed to this Philoxenus; but it is probably the work of a Philoxenus of Leucas. The fragments are published by Bergk, *Poetæ Lyrici Græci*, vol. iii. (Leipzig, 1882).

PHILTER, or **PHILTRE** (Lat. *philtrum*, from Gk. φίλτρον, *philtron*, φάρμακον *pharmakon*, love charm, from φιλεῖν, *philein*, to love). An artificial means of inspiring and securing love. A belief in such charms seems to have been generally prevalent from an early age. Among the Greeks and Romans (among the latter in the later days of the Republic, and under the emperors), love charms, and especially love potions, were in continual use. Probably certain poisonous or deleterious herbs and drugs were among their chief ingredients, to which other substances, animal as well as vegetable, are said to have been added, coupled with the employment of magic rites. Thessaly was famous for producing the most potent herbs, and her people were regarded as the most skillful practicers of magic arts, whence the well-known *Thessala philtra* of Juvenal (vi. 610). These potions were violent and dangerous, producing madness and death, instead of merely serving the purpose for which they were intended. The use of philters seems to have been not unknown during the Middle Ages; and in the East, belief in the power of love potions has never died out.

PHINEAS (fĭn'ê-*as*) **FINN**, THE IRISH MEMBER. A novel by Anthony Trollope (1869). It is the first of a series of political tales, *Phineas Redux*, *The Prime Minister*, and *The Duke's Children*, in which Finn and most of the characters of the story reappear. The hero, a handsome young Irishman, goes to London and enters Parliament. Much of his success is due to the Standish family, particularly Lady Laura. At the close he throws up his political career, retires to Ireland, and marries his former sweetheart, Mary Flood-Jones.

PHINEUS, fĭn'ê-ŭs *or* fī'nūs (Lat., from Gk. Φινεύς). A blind soothsayer, the son of Agenor, and King of Salmydessus in Thrace. Because of his cruelty to his children by his first wife, when his second wife accused them falsely, he was punished with blindness and was tormented by the Harpies, who seized or defiled all the food placed before him. He was delivered from the monsters by Zetes and Calaïs, and in return directed the Argonauts in their expedition. Other traditions represent him as being slain by Heracles or by Boreas.

PHIN'TIAS (Lat., from Gk. Φιντίας). A friend of Damon. See DAMON AND PHINTIAS.

PHIPS, or **PHIPPS**, Sir WILLIAM (1651-95). The first royal Governor of Massachusetts. He was born at a border settlement, since called Woolwich, on the Kennebec River, in Maine, and was one of a family of twenty-six children, all of the same mother. Till eighteen years of age he was employed in keeping sheep, but dissatisfied with this occupation, he became a ship-carpenter, and removed to Boston. There he learned to read and write, and also married a widow with some property. Some years later he conceived the idea of fishing up treasure stored in a Spanish galleon that had been wrecked fifty years before in the West Indies. The English Admiralty fell in with this plan and gave him command of a frigate, but after a long search he returned unsuccessful. A little later he was sent out again in a vessel provided by the Duke of Albemarle and others, and this time he found a wreck and took from it treasure to the value of about £300,000. As a reward for his success, he received as his share £16,000, the honor of knighthood, and the appointment as sheriff of New England. In

1690 he was sent by Massachusetts with a fleet of eight vessels against the French settlement of Port Royal in Acadia, and succeeded in capturing it. Later in the same year he commanded a larger expedition, consisting of 34 vessels and more than 2000 men, against Quebec. So active, however, were the French under Count Frontenac that the attempt failed, and on the way back to Boston nine of the vessels were wrecked. In 1692, through the influence of Increase Mather, the agent of the colony in England, Phips was appointed Governor of Massachusetts, under the new charter. One of his first official acts was to commission a special court for the trial of those accused of witchcraft, but some months later he suspended its sittings. As Governor he displayed many of the bluff and choleric traits of a sea captain; among other things, he cudgeled Brinton, the collector of the port of Boston, and caned Captain Short of the Royal Navy. In 1694 he was summoned to England to answer complaints made against him, and while there died suddenly of a malignant fever. Phips was a man of great energy and determination, but possessed no remarkable intellectual capacity; and he appears to have been strictly honest in his private dealings, though he deemed it no sin to steal from Frenchmen. There is a curious life of him in Cotton Mather's *Magnalia* (London, 1702), but more trustworthy is that by Francis Bowen in vol. vii. of the first series of Sparks's *American Biography* (New York, 1834-37). Consult, also, Hutchinson, *History of Massachusetts*; Parkman, *Count Frontenac and New France Under Louis XIV.* (Boston, 1877); and Myrand, *Sir William Phipps devant Québec* (Quebec, 1893).

PHIZ. The pseudonym of the English caricaturist and illustrator Hablot Knight Browne (q.v.).

PHLEBITIS (Neo-Lat., from Gk. *φλέψ*, *phleps*, vein), or INFLAMMATION OF THE VEINS. Although seldom an original or *idiopathic* disease, it is a frequent sequel of wounds, in which case it is termed *traumatic* phlebitis, and is not uncommon after childbirth. (See PHLEGMASIA ALBA DOLENS.) It commonly arises by the extension of an inflammation from contiguous structures, as in phlegmonous erysipelas or cellulitis, or by the plugging up of a vein by an embolus or thrombus. If severe, the disease begins with a chill or chilly sensations, and a rise in temperature. There is great tenderness and pain along the course of the affected vessel, which feels like a hard knotted cord, and rolls under the fingers. If the vessel is small the consequences of its obstruction may be of little importance, but when a large vein is affected the consequences are always dangerous, and may be fatal.

Phlebitis may terminate in one of several ways. The most favorable is by simple resolution—the clot is absorbed, the vein becomes permeable, and circulation is reëstablished. In other cases organization of the clot takes place, little blood vessels growing into it, from the walls of the vein, and the latter finally becomes a fibrous cord. The circulating blood is diverted to other channels which gradually dilate to accommodate the increased flow. Again, the clot may become infected, if it is not so from the beginning, undergo purulent softening, and the pus either be discharged by the formation of abscesses, or emptied into the blood current to be carried by the general circulation to all parts of the body. These purulent particles find lodgment in the large viscera, such as the liver, spleen, kidneys, and give rise to multiple abscesses. In the liver this frequently happens from inflammation of the portal veins. This general distribution of septic material is known as *pyæmia* (q.v.) An organized clot may in rare instances become calcified by the deposition in it of lime salts, and form a *phlebolite*.

The treatment of phlebitis comprises rest in bed, elevation of the part, and the local application of antiphlogistics—lead water and opium at first, hot fomentations later. If abscesses form, they must be opened and drained. In certain cases it is possible to ligate the vein above and below the clot, open the vessel, and wash out the purulent material. The internal treatment varies with the symptoms, but in general must be stimulating.

PHLEB'OLITE (from Gk. *φλέψ*, *phleps*, vein + *λίθος*, *lithos*, stone). A calcareous concretion formed by the degeneration of coagulations in veins. It is not infrequently to be felt as a nodule varying in size from a pinhead to a small bean along the course of chronically inflamed veins of the lower extremity, and phleboliths have been known to attain considerable size.

PHLEBOTOMY. See BLEEDING.

PHLEGETHON, flĕg'ē-thŏn (Lat., from Gk. *φλεγέθων*, from *φλέγειν*, *phlegein*, to burn). In Greek mythology, a river of the lower world, along with Acheron, Cocytus, and Styx (qq.v.). In Homer it unites with Acheron, as does Cocytus, a branch of the Styx. Later writers described its fiery torrent and scorched and desolate shores.

PHLEGMA'SIA AL'BA DO'LENS (Neo-Lat., painful white inflammation), or MILK-LEG. A painful general swelling of a limb, due to the obstruction of the veins; a plastic phlebitis. It is due to pressure, general disease, sepsis, or thrombosis. Milk-leg occurs principally as an affection of women in childbed, occasionally during typhoid fever. The first symptom is a rise of temperature, which may be overlooked. Pain first attracts attention, felt on the inside of the thigh, in the groin, and in the calf, of a very severe character. There may be numbness, tingling, cramps, or creeping sensations. The limb swells early from a soft œdema, the skin being white and shining, often waxy. Blue veins may stand out prominently on the posterior part of the limb. Fibrinous coagula may be detached and carried along in the circulation to some other part, as the lung, forming embolism. Paralysis of motion, disorders of sensation, and wasting of the limb may occur. The treatment consists of supporting the limb on a higher level than the trunk; punctiliously avoiding any jarring of it; maintenance of the recumbent position for at least a month; fomentations to the limb, which must be wrapped, in the intervals, in cotton; support of the heart with appropriate drugs; control of pain with analgesics and of insomnia with hypnotics. The great danger is from pulmonary embolism, which is almost invariably fatal.

PHLEGRÆ'AN PLAIN (Lat. *Phlegræi Campi*). A region west of Naples, embracing the volcanic plain on the Campanian coast from

Cumæ to Capua. There legend placed the scene of the combats between the gods and the giants. The Romans filled it with palatial villas, and their poets celebrated its charm and productiveness. The volcanic disturbances to which the region has been subject have left of the magnificent buildings of the Romans only confused ruins, in part submerged under the sea.

PHLEGYAS, flĕj'i-ăs (Lat., from Gk. Φλεγύας). The son of Ares, and father of Ixion and Coronis. His daughter became by Apollo the mother of Æsculapius. Phlegyas was so incensed that he set fire to the temple of the god, and for this was condemned to everlasting fear in Tartarus, where an overhanging rock constantly threatened to fall on him.

PHLOEM, phlō'ĕm (from Gk. φλοιός, *phloios*, bark), or BAST. That portion of a vascular bundle in plants including the sieve tissue, parenchyma, and bast fibres, and in ordinary trees forming the inner bark. See STEM.

PHLOGIS'TON. See CHEMISTRY.

PHLOG'OPITE (from Gk. φλογώψ, *phlogōps*, flaming-red, from φλόξ, *phlox*, flame + ὤψ, *ōps*, face). A magnesium mica, similar to biotite, but differing from it in composition by usually containing fluorine and less iron. It crystallizes in the monoclinic system, has a pearly lustre, and is usually of a light yellow to brown and red color. The phlogopite occurs in serpentine rocks and frequently in association with limestone or dolomite. Phlogopite often exhibits asterism, especially when seen by transmitted light, as when a candle flame is viewed through a thin sheet. This property has been shown to be due to minute needle like inclusions arranged chiefly in the direction of the rays of the pressure figure, producing a distinct six rayed star. Phlogopite is found in Finland, Sweden, Switzerland, and in the United States at various localities in New York, New Jersey, and also in Canada.

PHLOX (Lat., from Gk. φλόξ, sort of flower, flame, from φλέγειν, *phlegein*, to burn; connected with Lat. *flagrare*, to burn, Skt. *bhrāj*, to shine brightly). A genus of mostly tall, erect, spreading perennial herbs belonging to the order Polemoniaceæ, natives of North America. The

CULTIVATED FORM OF MOSS PINK (*Phlox subulata*).

species, nearly all of which have a wide natural distribution within the United States, have entire leaves, and generally very showy flowers either solitary or in terminal clusters. Owing to their hardiness, easy cultivation, and the size and beauty of their flowers, many hybrid varieties with single and double flowers, in many colors, forms, markings, and long period of bloom, and a few of the pure species, are grown in gardens, being well adapted for planting on rockeries and in borders and groups. The best known annual species of this genus is *Phlox Drummondii*, a native of Texas, from which all annual phloxes now in cultivation have been derived. *Phlox pilosa* is a somewhat variable species which flowers from May to August. *Phlox reptans* is native to the Alleghany Mountains. *Phlox Stellaria* is much prized as an ornamental plant on account of its numerous white flowers. The ground or moss pink commonly grown in gardens is *Phlox subulata*. The wild sweet William (*Phlox divaricata*) has pale lilac or bluish flowers appearing in spring and early summer. All the species of phlox grow readily in ordinary rich soil; the annuals from seeds and the perennials from seeds, division of the stools, or cuttings of the stems and roots. The seeds are sown early in the spring, given gentle heat, and after the seedlings are large enough they are transplanted, hardened under glass, and later set out in the open. The stem cuttings are made in summer and placed in fine sandy soil under cold frames or in greenhouses. The root cuttings when slightly covered with soil and placed in gentle heat sprout readily. After the cuttings have rooted they may be treated like the seedlings.

PHOCÆ'A (Lat., from Gk. Φώκαια). The northernmost of the Ionian cities of Asia Minor, about twenty miles northwest of Smyrna. It was said to have been originally settled by Phocians. It was included in the Ionian confederacy, and was one of the most flourishing and powerful of the Asiatic Greek cities. Its sailors were famous for the daring with which they pushed their fifty-oared war-vessels (not the heavy merchant craft) into the western seas. The westernmost colony of the Phocians was in Mænaca, in Spain, and they were on close terms of friendship with Arganthonius, King of Tartessus. Their most famous colony, however, was Massilia (Marseilles). Unable to defend themselves against Harpagus, the general of Cyrus, they abandoned their city and sailed to Chios (c.540 B.C.). Part of them subsequently decided to return and accept the Persian rule, but the majority sailed to Corsica and settled in Alalia. Attacked by the Carthaginians and Etruscans, who resented Greek entrance upon these lands, they were victorious in a great naval battle, but thought it wiser to abandon their settlement and move to Southern Italy, where they founded Hyele, or Elea (Velia). Phocæa seems to have continued to exist, though it is scarcely mentioned till it was captured and plundered by the Romans in the war with Antiochus. New Phocæa was founded by some Genoese about 1420, and this spot is now occupied by a little village, Phokia, while the site of the old city is still called Palæo-Phokia.

PHOCAÏS, fō-kā'ĭs. An epic poem ascribed to Homer, and said to have been composed by him in Phocæa.

PHO'CAS (Lat., from Gk. Φωκᾶς, *Phōkas*) (?-610). Byzantine Emperor from 602 to 610. He was an obscure centurion in the army, which was fighting the Avars on the Danube, when in 602 the soldiers rose in rebellion against the Emperor Maurice (q.v.), and Phocas was chosen their leader. He invested Constantinople, and after the forced abdication of Maurice was chosen and crowned Emperor. His first act was to cause the

public execution of Maurice and his five sons, and throughout his reign he was notorious for his cruelty. In Europe an ignominious peace was maintained, while in Asia unsuccessful war was waged against the Persian King Khosru II. (q.v.). He gave his only child in marriage to the patrician Crispus, and the images of the couple were indiscreetly placed by some of their friends in the circus, which was a privilege of royalty only. After this Crispus no longer felt secure, and he conspired with the rebellious exarch of Africa, Heraclius, to dethrone Phocas. This was accomplished in 610, and the tyrant was tortured and beheaded.

PHOCAS, Column of. A famous column in the Roman Forum, erected in 608 by the exarch Smaragdus in honor of the Eastern Emperor Phocas, and once surmounted by a gilded statue of Phocas. The column is 54 feet in height, and is of a better style than that which prevailed at the time of its dedication. It is therefore supposed that it may have been taken from some earlier edifice, or that an already existing monument was rededicated by Smaragdus. It was covered by the accumulated rubbish of centuries till 1813, when it was unearthed by the Duchess of Devonshire.

PHOCION, fō'shī-ŏn (Lat., from Gk. *Φωκίων, Phokiōn*) (c.402-317 B.C.). An Athenian general. He was of humble origin, but received a good education and studied under Plato and Xenocrates. His first public service was performed under Chabrias at Naxos in B.C. 376. About 349 he was sent into Eubœa to quell a disturbance that had been fostered in Eretria by the partisans of Philip of Macedon, and won a victory at Tamynæ. Some years later he led a body of Athenian hoplites to Megara, crushed Philip's faction there, and reëstablished the long walls to Nisæa; and also again conducted a force to Eubœa, where he liberated Oreus and Eretria from Macedonian influence. In 340 he was sent to the Propontis to act against Philip, who, besides suffering a number of minor reverses, found himself forced to abandon the siege of Byzantium and Perinthus. In politics, however, Phocion was a supporter of Philip and an adversary of Demosthenes, though not from mercenary or traitorous motives. When, after the destruction of Thebes in 335, Alexander sent to Athens demanding the surrender of Demosthenes and the other leaders of the anti-Macedonian party, Phocion advised compliance with the King's wishes. The proposal was rejected by the people, and an embassy was sent to Alexander to deprecate his resentment, but not until a second embassy had been sent, at the head of which was Phocion, was the King induced to remit his terms. After the death of Antipater Phocion became implicated in the intrigues of Cassander, the rival of Polysperchon, and was forced to flee to Phocis, but was surrendered to the Athenians and by them condemned to drink the hemlock. His body was carried out of Attica into the Megarid and there burnt. Shortly after his death there was a revulsion of feeling in his favor among the Athenians. They then celebrated his funeral obsequies at the public expense, and erected a statue in his honor. Consult Plutarch's *Life of Phocion.*

PHO'CIS (Lat., from Gk. *Φωκίς, Phōkis*). In ancient geography, a division of Northern Greece, bordered on the west by Ozolian Locris and Doris, on the north by Epicnemidian and Opuntian Locris, on the east by Bœotia, and on the south by the Gulf of Corinth. The greater part of the country is mountainous, with Parnassus filling the central and western portion, and only a section in the northeast, through which the Bœotian Cephissus flows, is fertile. The chief town was Elatea, which commanded the entrance into Bœotia from the north. Other towns of some importance were Daulis, Abæ, the seat of an ancient oracle, and Hyampolis, but the most conspicuous place, to which the fame of the land was chiefly due, was Delphi, whose inhabitants, however, always claimed that the control of the oracle did not belong to the Phocians. The State was a league of 22 cities, most of which were of small size. The Phocians seem to have been akin to the Dorians, though there were elements derived from earlier settlers in those regions, and there is some evidence for colonization in the southern portion from Crete and the Peloponnesus. They do not play a prominent part in the earlier history of Greece, though we hear of a desperate defense against the advance of the Thessalians, and in general they appear as enemies of the Thessalians and Bœotians and friends of the Athenians, who supported their claim to control Delphi. In B.C. 357 the Amphictyonic Council, apparently through Theban influence, imposed a heavy fine on the Phocians for cultivating some land belonging to the Delphic oracle. The Phocians resisted the sentence and were favored, but not actively assisted, by Athens and Sparta, who were at that time on bad terms with the Council and hostile to Thebes. The Phocians seized Delphi and 'borrowed' the temple treasures with which to maintain their army. For ten years the war was waged with no decisive results, though in general to the advantage of the Phocians. Even the growing power of Philip of Macedon did not check them, for while he was victorious in Thessaly, he could not pass Thermopylæ, which was held by a Phocian army and an Athenian fleet. The Peace of Philocrates (B.C. 346) between Athens and Philip left the Phocians helpless, and the sentence of the Amphictyons, which expelled them from the Council, condemned them to an enormous fine and dispersed them into small villages, thus practically removing them from future history.

PHOCYLIDES, fō-sil'i-dēz (Lat., from Gk. *Φωκυλίδης, Phokylidēs*) (c.560 B.C.?). A Greek poet of Miletus, contemporary with Theognis. He wrote chiefly didactic poems in two or three verses of hexameters or elegiac metre, the eighteen extant fragments of which have been included in almost all of the collections of the lyric and gnomic poets. Ποιήμα νουθετικόν, the admonitory poem, in about two hundred and thirty hexameters, which has been preserved under his name, is now supposed to have been the work of an Alexandrine Jew of the first century B.C. Consult: Bergk, *Poeta Lyrici Graci* (5th ed., Leipzig, 1900 et seq.); and Bernay, *Ueber das phokylidäische Gedicht* (Berlin, 1856).

PHŒ'BE. (1) A name applied to the goddess Artemis or Diana (q.v.). (2) In Shakespeare's *As You Like It*, a fickle shepherdess who falls in love with the disguised Rosalind, but at last marries the shepherd Silvius, her former lover. (3) A New England girl of strong common sense in Hawthorne's *Marble Faun.*

PHŒBE-BIRD. A small olive-green, brown-headed tyrant flycatcher or pewee (q.v.) of the United States, very familiar in gardens and named in imitation of its call. It makes a cup-shaped nest of mud and moss, which it attaches to rocky ledges and cliffs, or often to the piers of bridges, eaves of houses, and the like, and lays white eggs.

PHŒBUS, fē'bŭs (Lat., from Gk. *φοῖβος, phoibos*, bright, pure). A title of Apollo, which even in Homer has become closely joined to his name. It refers to the god as the purifier from all stains of sin. Originally Phœbus seems to have been an independent deity, but the transparent meaning of the name prevented the development of a personality, and made easy the absorption in the great defender from all evil, Apollo.

PHŒBUS, William (1754-1831). A Methodist pioneer preacher. He was born in Somerset County, Md., and entered the ministry in 1783. He was a member of the Christmas Conference at Baltimore in 1784; in 1798 he located and practiced medicine in New York, but reëntered the ministry in 1806. He desired the church to be called the Evangelical Church of America, and wrote a work entitled *An Essay on the Doctrine and Order of the Evangelical Church of America as Constituted at Baltimore, 1784* (1817). He edited the *Experienced Christian's Magazine* (1796). His grandson, George A. Phœbus (1830-1903), entered the Philadelphia Conference, 1853, and afterwards became a member of the Wilmington Conference. He published *Beams of Light on Early Methodism in America, Chiefly Drawn from the Papers of Rev. Ezekiel Cooper* (1887), a work of very great importance as a source book of Methodist history.

PHŒNICIA, fē-nish'i-ȧ (Lat., from Gk. *Φοινίκη, Phoinikē*, Phœnicia). The name used by the Greeks and Romans to designate the strip of territory about 200 miles long, from 5 to 15 miles broad, along the Mediterranean coast of Syria. On the east this tract is bounded by the Lebanon Mountains, being watered by the streams that flow from them. The northern and southern limits are not easily defined and varied from time to time. Ptolemy fixes the northern boundary at the Eleutheros (Nahr el-Kebir) and the southern at Mount Carmel, but there were undoubtedly Phœnician settlements both farther north and farther south. The origin of the name is unknown. Its derivation from *phoinix* (date palm) is uncertain, as there is no evidence to show that that tree grew in Phœnicia. A more probable derivation is from the Greek *phoinos* (blood-red), referring to the purple which the Phœnicians introduced into Greece. In the Old Testament this territory is designated as part of Canaan (q.v.), and the inhabitants as Sidonians. This latter designation occurs also in Homer, and points to a period when the land was under the leadership of the City of Sidon. Being shut off from the east and the south by mountain ranges, and on the west limited by the sea, it was impossible for Phœnicia to play any important political rôle. Nor were the different settlements ever welded together into one powerful kingdom. They formed a nation with one or the other holding the hegemony. The northernmost port was Arvad or Aradus (the modern Ruad, mentioned in Ezek. xxvii. 8, 11, and in Assyrian inscriptions, situated on an island near Tripolis. A second port was Simyra (Assyrian, Sumari or Simirra), mentioned in the Amarna letters (c.1400 B.C.), and in Gen. x. 18. The most important of the northern towns was Gebal, called by the Greeks Byblos (q.v.). It had relations with Egypt and Assyria in very early times and exercised a sort of supremacy over the country around it, rivaling Sidon and Tyre in the south and preserving its independence through the greater period of Phœnician history. The city of Berytus (Beirut) belonged originally to the Principality of Byblos, but afterwards became independent. Farther south were the cities of Sidon, Sarepta, Tyre, and Acco (Acre), all of which were old settlements, going back at least to about B. C. 1800, when Egypt inaugurated her Western Asiatic campaigns. Several of these cities stood on islands and were thus fortified by nature. Of these cities Tyre and Sidon (qq.v.) arose to a controlling position and from time to time interchanged as the ruling power. There were also a number of inland towns, such as Kana, but they never attained to any importance.

It is impossible to say at how early a date the Semitic population formed settlements here. They must have come upon one of the migratory waves that issued from the Tigris-Euphrates valley, and their close relationship to the Hebrews shows that they branched off with them from the Aramæan wave which formed permanent settlemens in Northern Syria. At the time the Amarna tablets were written (c1400 B.C.) the coast towns were all occupied by Semites; and from what is now known of the history of the relations between Babylonia and Syria in early days, the settlement of the Semites in Phœnicia may be placed c.2500 B.C. or earlier. This would agree with the assertion of Herodotus that Tyre was founded about B.C. 2730.

What little is known of the history of Phœnicia may be divided into six periods: (1) From the earliest time to the Egyptian supremacy, c.1800 B.C.; (2) the period of Egyptian control to c. 1400 B.C.; (3) the advance of the Hittites and the Assyrians to c.1100 B.C.; (4) the period of independent development, B.C. 1100 to 900; (5) Assyrian and Babylonian control, to the downfall of the Neo-Babylonian dynasty, B.C. 539; (6) the period of the Persian, Greek, and Roman supremacy. The earliest period must have been dominated by Babylonian influences, as we find Babylonian script and language used as the medium of diplomatic correspondence. This was maintained even after the rulers in the Phœnician and Palestinian cities had become vassals of Egypt. The Babylonian King Sargon (B.C. 3800) extended his conquests as far as Cyprus, and he must have laid a part of Phœnicia under tribute. Each settlement at the time formed a sort of independent principality. In the papyrus Anastasi I. (sixteenth century B.C.) the Phœnician cities Byblos, Berytus, Sidon, Sarepta, Tyre, and Aradus are mentioned. The influence of Egypt was strong. She exacted a tribute, kept the principalities under native rulers, and discouraged any coalition. The country unfortunately lay between Egypt and her great rival, the State of the Hittites. This people, having secured possession of the districts around Damascus and Tunip, maintained a successful opposition to the Egyptian armies; and Rameses II. was obliged to make a treaty with them, yielding the

territory north of Mount Carmel. The city of Tyre was at this time gradually reaching the position of eminence which it kept for several centuries; Sidon played a secondary part, the oldest colonies having been sent out by the former city. In the thirteenth century Assyria first commenced to check the growing power of the Hittites. For a time the coast cities were forced into a position of vassalage; but after the death of Tiglathpileser I. (c.1100 B.C.) Syria, Palestine, and Phœnicia enjoyed a brief respite. In Phœnicia a coalition was formed with Sidon at its head. Tyre, however, set aside her rival and under Abibal (tenth century B.C.) and his son, Hiram, extended her control to Cyprus. It was this Hiram who furnished workmen and material for Solomon's building operations in Jerusalem. (See HIRAM.) Asshurnasirpal (B.C. 870) received tribute from Tyre, Sidon, Byblos, and other cities. Assyria had great difficulty in holding these distant places. Rammannirari III. had again to subdue Tyre and Sidon (B.C. 803), and Tiglathpileser III. (B.C. 734 to 728) not only sent one of his generals there, but colonized people of other nations in the district. King Luli (Elulæus) fell off completely from Assyria, and, under the leadership of Hezekiah of Judah, made common cause with Tirhaka. Sennacherib (B.C. 700) forced him to flee to Cyprus, putting a new king, Ittobaal, in Sidon. In B.C. 678 Sidon was destroyed and the various rulers in Phœnicia and Cyprus did homage to the Assyrian King. The power of Assyria was, however, on the wane, and under Psammetik I. (B.C. 625) Egypt commenced to exert her sway once more over the coast. In B.C. 585 Tyre was again invested by Nebuchadnezzar II., and though the other Phœnician cities fell early into his power, it held out for 13 years. King Ittobaal and his family were carried off to Babylon. In B.C. 539 Phœnicia, after the rule of a few legitimate kings, sent there from Babylon, became part of the Persian kingdom.

During the Persian period Sidon forged ahead of her old rival. The seacoast towns, with their large fleets, were necessary for the maritime operations of the Persian kings. Three hundred Phœnician triremes warred with Xerxes against Greece. Eighty Phœnician ships engaged in the battle of Cnidus (B.C. 396). Like its old rival, Sidon became involved in the quarrel of the two great nations who fought for the supremacy of Western Asia. Under Tennes II. it joined with Nectanebo II. of Egypt and might have been successful had not its King betrayed it to Artaxerxes III. This caused a great catastrophe (B.C. 345) in which 40,000 lost their lives. The power of Sidon was broken. On the reappearance of Alexander the Great in Phœnicia, Sidon, Aradus, and Byblos immediately submitted, but Tyre held aloof and capitulated only after a siege of seven months (July, B.C. 332). Eight thousand lost their lives, 30,000 were sold as slaves. Sidon and Tyre, and together with them Phœnicia, vanished from the world's history. Yet we hear of the cities again during the reign of the Ptolemies, and a certain amount of autonomy must have been given at least to Sidon and Tyre. Phœnician inscriptions tell of independent rulers in the fourth and third centuries B.C., notably in Sidon, where the family of Eshmunazar ruled. In B.C. 197 Phœnicia came into the power of the Seleucid kings of Syria and became involved in the collapse of that kingdom. In B.C. 64 it became with Syria a Roman province; and although the trade of the seacoast towns was greatly benefited thereby, their Phœnician character was rapidly lost and forgotten.

The influence of Phœnicia was, however, not confined to the narrow coast strip of Syria. At an early date her merchants brought about a contact between the East and the West, which constituted an important factor in ancient history. These merchants traveling through the Mediterranean formed colonies wherever they went and many of the place-names along the African coast seem to show that Phœnicians became there the dominant factors.

Only some of the general features of Phœnician religion are known. Each town had its protecting deity, with whom a female consort was often associated. In many cases this god was known simply as the Baal, i.e. Lord, of the place. In others he bore a special name, such as Melkart in Tyre, Sakkun in Carthage. The Phœnician pantheon was quite large, though some of the names may be different designations applying to one deity. The most important of their deities were Adonai (Greek Adonis, q.v.), worshiped in Byblos and whose cult was also transferred to Cyprus; Eshmun, a sun god, worshiped at Sidon, Berytus, and Carthage, and in Cyprus; Melkart, at Tyre; Tanith, the great goddess of Carthage, who was often associated with a Baal, as was Astarte on the Phœnician mainland. Foreign gods were also easily admitted into this pantheon; e.g. the Syrian gods Reshef and Anat; the Egyptian Isis, Osiris, Bast, and Horus; and the Babylonian Hadad. A parallel to this is found in the general tendency of the Phœnicians to adopt the art, culture, and myths of the surrounding peoples. Their religion therefore presents a strangely conglomerate character. Traces of primitive conceptions which they shared with other Semitic peoples persisted to the latest period. Trees, stones, and rivers were regarded as sacred principles underlying the animistic stage of religious development. In early days the cult was carried on in groves or on the tops of mountains. In later times small sanctuaries were erected and inclosed in a sacred area. Subsequently, and perhaps under foreign influence, more elaborate structures were erected, temples with a large altar in a court open to the sky to which was attached a covered shrine, which was regarded as the holy of holies. The chief festival of the Phœnicians seems to have been the one which was celebrated at the time of the summer solstice, commemorating the death and return of Adonis. The priesthood must have assumed large proportions, but it does not seem to have wielded the power that the priesthood did in Egypt and Babylonia, though the ruler at times was also chief priest.

BIBLIOGRAPHY. Movers, *Die Phönizier* (Bonn, 1841-56); Neltzer, *Geschichte der Karthager* (Berlin, 1879-96); Pietschmann, *Geschichte der Phönizier* (ib., 1889); Jeremias, *Turus bis zur Zeit Nebukadnezars* (Leipzig, 1891); George Rawlinson, *History of Phœnicia* (London, 1889); the fragments of Menander's "Annals of Tyre," in Cory, *Ancient Fragments* (ib., 1871); Winckler in Helmolt's *History of the World*, vol. iii. (Leipzig, 1901).

PHŒNICIAN ART. The art of the Phœnicians was both cosmopolitan and commercial.

Their lack of originality and of artistic sense made it easy for them to turn their energies to copying the arts of their powerful neighbors, especially Egypt and Assyria, and to cultivating those branches of art that were merchantable and transportable. They show the influence of the Hittite and other Syrian tribes in their magnificent fortifications, and of the Iranians, perhaps, in their lack of monumental temples. A branch of their school in Cyprus developed monumental sculpture in stone under archaic Greek influence, and this was echoed in the Phœnician settlements in Spain (e.g. Elche); but otherwise large sculptures in stone seem rare. It was otherwise with works in metal, from bronze to gold, and in terra-cotta, glass, iron, and textile objects. In all these branches the Phœnician artisan distinguished himself, and supplied most civilized nations. It was after B.C. 1000 and before 500, when international commerce was almost exclusively in the hands of the Phœnicians, that this art was most brilliant and that we find its products in the tombs, palaces, and sanctuaries of nearly every country of the Mediterranean and of Western Asia. Later the African branch, with its centre at Carthage, continued its history, even under Roman dominion, as is being brilliantly shown by Delattre's excavations.

Architecture. The eclecticism of the Phœnicians appears in their monuments. From the few surviving remains it would seem that Babylonian, Egyptian, Assyrian, and Persian influences alternated. The little temple of Amrith is thoroughly Egyptian, and so are the less important tabernacles at Ain-el Hayat. The general scheme of the larger temples was a court in which the cella or tabernacle rose on a basement: a plan comparable to that of the Temple of Jerusalem. The temples of Cyprus should be reckoned with those of Phœnicia, though they approach closer to the Greek type with columnar portico. Of the famous temples of Tyre, Sidon, Gebal, and Paphos nothing remains. Almost as thorough a destruction has overtaken the military and civil constructions by which the Phœnician cities were made almost impregnable. Something remains at Aryad, Berytus, Sidon, and at Eryx, in Sicily, in magnificent masonry that passes from the earlier polygonal and cyclopean to the later Hellenic course construction in stone. Thapsus alone has preserved part of its harbor constructions—so important in all Phœnician cities. As in the case of the Etruscans, we can learn something from the sepulchral architecture, both the free-standing specimens, like the circular monolith of Amrith with its guardian lions, and the other one at the same place in the form of a house with pyramidal roof, and the other type of rock-cut chambers, such as those of Carthage and nearly all the cities.

Sculpture and Minor Arts. The anthropoid sarcophagi, of which the Louvre possesses a number, while others, found at Sidon, are now in the Museum of Constantinople, show the influence of Egypt on monumental Phœnician sculpture. But the sarcophagi and statues found by Cesnola and others in Cyprus are by far the largest part of the Phœnician plastic patrimony. Here, even more than in Persian sculpture, we find that the Hellenic idea of letting the form of the body pierce through the drapery was adopted, and that the attempt at expressiveness took the form of the grimace or smile. There is a curious amalgamation in this school of such Hellenic elements with others from Egypt and Assyria, with the composition varying according to political predominance. Statues of gods and goddesses as well as of priests, sometimes colossal, show facility of execution. The sarcophagi, especially that from Amathus, are of equal importance, and are in high relief, in contrast to the Assyrian low-relief technique.

In the field of metal work the most extraordinary objects that have been preserved are the great bronze votive shields from the cave of Zeus on Mount Ida, in Crete, with their Egyptian sphinxes, Assyrian lions, and figures of Merodach and zones of animals like those on the early Greek vases (especially Corinthian). Equally important on a smaller scale are the silver dishes or pateræ found in Assyrian palaces (Nimrud), in Cyprus, and in some Italian tombs, with their exquisite scenes engraved or in relief, from mythology, legend, or daily life. The Dali cup in the Louvre, the Palestrina patera and those from Curium in the Metropolitan Museum, are the finest pieces of work preserved from Oriental antiquity. The mixture of subjects shows that the Phœnician artist cared less for the significance than for the artistic quality of the design, and often made mistakes in copying scenes originally conceived by Assyrian or Egyptian artists.

The gold and silver ware on the tables of Oriental monarchs, their bronze serving-vessels, were usually the work of these Phœnician artists, who were everywhere, even in Nineveh. It was not quite the same with ivories, only some of which are Phœnician. But, on the other hand, the Phœnicians absorbed nearly all the trade in glass vessels, after learning the art from Egypt, and the glass factories of Tyre and Sidon and Berytus remained famous even through the Middle Ages. The collection in the Metropolitan Museum, mostly from the Charvet collection, one of the finest in existence, contains many Phœnician pieces, and the tombs that are continually being opened in Phœnicia furnish more glass than any other class of objects.

It would seem as if in jewelry the Phœnicians played the important rôle of giving models to Greek and Etruscan artists after learning from Egyptian and Asiatic artists. Lotus flowers and anthemions, heads of Isis, of Hathor, and other gods and genii, animals and birds in relief or as pendants, rosettes and groups of balls hanging from chains, formed most elaborate designs in earrings, necklaces, tiaras, etc. In the field of engraved stones, precious or rare, the Phœnicians imitated as usual; the Egyptian scarab and the Assyro-Babylonian cylinder and seal were equally popular, with borrowed mythological scenes, until, in the fourth century B.C., the fashion turned exclusively to Greek models.

Bibliography. The standard work of reference is the two volumes on Phœnicia in Perrot and Chipiez, *History of Ancient Art*, but this can be supplemented for architecture by Renan, *Mission de Phénicie* (Paris, 1865-74); by Fröhner, *La verrerie antique*, for the Charvet collection of glass; by Ménant, *La glyptique orientale*, for engraved gems and stones; by Clermont-Ganneau, *L'imagerie phénicienne* (Paris, 1880), for the silver pateræ; by Orsie Halbherr, *L'antro di Zeus in Creta* (Rome, 1883), for the Phœnician shields, etc.

PHŒNICIAN LANGUAGE. The language spoken by the inhabitants of Phœnicia. It belonged to the Hebræo-Phœnician division of the Semitic family of languages, and represents in general an archaic stage of Hebrew and Moabitic, although it differs from the North Semitic group in certain particulars, such as having *kān* (like the Arabic *kāna*) for the copula instead of *hāyā*, as in Hebrew. Phœnician spread widely from its home as Punic colonies were founded in the islands of the Mediterranean and Ægean, in Southern and Western Asia Minor, Southern France, and especially in Northern Africa. The diffusion gave rise to variations both of dialect and script, which were, however, comparatively slight. The sources of our knowledge are the inscriptions, coins, and seals, the transliteration of Phœnician phrases in Plautus's comedy of the *Pœnulus*, and the proper names and words found in the Old Testament, in the inscriptions of Assyria and Egypt, and in classical writers. The inscriptions are by far the most important source. Although they are very numerous, the vocabulary is relatively scanty on account of their monotonous content. They cover the period from about B.C. 600 to A.D. 200. The longest are the inscriptions found at Sidon in 1855 of twenty-two lines, at Marseilles in 1845 of twenty-one lines, and at Larnaka in 1879 of twenty-nine lines. The passage in the *Pœnulus* and the words and names in other foreign sources are of value in fixing the vocalization and pronunciation of Phœnician, since the alphabet, like all the Semitic scripts, excepting the Assyro-Babylonian and Ethiopic, writes only the consonants. The alphabet, which itself seems derived from the South Arabian script, is of importance as the ancestor of the Græco-Roman family of alphabets. (See Plate of ALPHABETS.) Phœnician literature seems to have been very scanty, consisting chiefly of annals, and at least one work, by Mago, on agriculture, and has been entirely lost with the exception of Greek translations of the voyage of Hanno (q.v.) and fragments asserted to be translations of the histories of Sanchuniathon (q.v.). Consult: Schröder, *Die phönizische Sprache* (Halle, 1869); Bloch, *Phönizisches Glossar* (Berlin, 1891); Gesenius, *Scripturæ Linguæque Phœniciæ Monumenta Quotquot Supersunt Edita et Inedita* (3 vols., Leipzig, 1837); *Corpus Inscriptionum Semiticarum* (Paris, 1881–87). See SEMITIC LANGUAGES.

PHŒNIS'SÆ (Lat., from Gk. *Φοίνισσαι, Phoinissai*, Phœnician Women). A play by Euripides, so called from its chorus of Phœnician captives at Thebes. The myth which forms the subject of the play is the same on which the *Seven Against Thebes* is based.

PHŒ'NIX (Lat., from Gk. *φοίνιξ, phoinix*). The name of a mythical Egyptian bird frequently mentioned by classical writers. Herodotus (ii. 73), who says he heard the story at Heliopolis and saw a picture of the bird there, relates that the phœnix, on the death of his father, embalms the body in an egg made of myrrh and conveys it from Arabia to the Temple of the Sun at Heliopolis. According to Pliny (Nat. Hist., x. 2), there is only one phœnix at a time, and when he perceives that his end is near, he builds in Arabia a nest of twigs of cassia and frankincense and dies upon it. From the body is generated a worm which develops into the new phœnix. The young bird then conveys his father's body to Heliopolis and burns it upon the altar there (Tacitus, *Ann.*, vi. 28). According to Horapollo (ii. 57) the phœnix casts himself upon the ground and receives a wound, from the ichor of which springs his successor. But the most familiar version of the birth and death of the phœnix is that in which the bird burns itself upon a nest or pyre of odoriferous woods, and the young phœnix springs from the ashes. The interval between the bird's appearances at Heliopolis is variously stated; the period usually named is 500 years, but 1461 and 7006 years are also given. According to Tacitus (*Ann.*, vi. 28) the phœnix appeared four times in Egypt: (1) under Sesostris (q.v.); (2) under Amasis; (3) under Ptolemy III.; and (4) in the year B.C. 34.

In Greek and Roman art it was common to represent the phœnix as an eagle; but by the Egyptians, who called it *Bennu*, the bird was depicted as a heron with two long feathers growing from the back of its head and sometimes with a tuft hanging from its breast. It symbolized the morning sun rising out of the glow of dawn, and hence it was looked upon as the sacred bird of the sun-god Rē. It also represented the new sun of to-day springing from the body of the old sun of yesterday, which had entered the lower world and become one with Osiris. Hence the phœnix or *bennu* was regarded as a manifestation of Osiris and became a symbol of the resurrection, continuing to serve as such even in early Christian times. It has been supposed by some scholars that the phœnix is mentioned in Job xxix. 18 and Psalm ciii. 5, but the identification is very doubtful. Consult: Kirchmayer, "On the Phœnix," in *Collectanea Adamantaa*, No. xv., vol. ii. (Edinburgh, 1886); Wiedemann, *Religion of the Ancient Egyptians* (New York, 1897).

PHŒNIX. A city in Lee County, Ala., on the Chattahoochee River, opposite Columbus, Ga., and on the Central of Georgia Railroad (Map: Alabama, D 3). It is a residential place, and is also of considerable importance as a commercial centre. Among the chief buildings are the city hall and the fraternal society hall. Settled about 1860, Phœnix was first incorporated in 1883. It is governed under a charter of 1894, which provides for a mayor, elected every two years, and a council. Population, in 1890, 3700; in 1900, 4163.

PHŒNIX. A city, the county-seat of Maricopa County, Ariz., and capital of the Territory, 100 miles northwest of Tucson; on the Maricopa and Phœnix and the Santa Fé, Prescott and Phœnix railroads (Map: Arizona, B 3). Among the more prominent points of interest are the Capitol building, insane asylum, agricultural experiment station, city hall, court house, and high school and central school buildings. The city is a popular winter resort. It has extensive commercial interests, controlling an important trade in live stock, grain, hay, honey, wines, oranges, and other fruits. Settled in 1870–75 Phœnix was incorporated in 1881. The government, under a charter revised last in 1893, is vested in a mayor, who holds office for two years, and a council which exercises some powers of confirmation and election in administrative offices, though the majority are filled by popular election. Population, in 1890, 3152; in 1900, 5544.

PHŒNIX PARK. A public park of 2000 acres in Dublin, containing a granite monument in honor of Wellington. The park became famous through the assassination within its borders, on May 6, 1882, of Lord Frederick Cavendish, Chief Secretary for Ireland, and Thomas Burke, the Under Secretary.

PHŒ'NIXVILLE. A borough in Chester County, Pa., 28 miles northwest of Philadelphia; at the junction of French Creek with the Schuylkill River, and on the Pennsylvania and the Philadelphia and Reading railroads (Map: Pennsylvania, F 3). It has a public library and a hospital; and is an important manufacturing centre, well known for its great iron mills, boiler works, silk mills, underwear and hosiery mills. There is also a match factory. The government is vested in a burgess, chosen triennially, and a council which elects all municipal officials excepting the school directors, who are independently chosen by popular vote. The borough owns and operates the water-works. Phœnixville was settled in 1792 and was incorporated as a borough in 1849. Population, in 1890, 8514; in 1900, 9196.

PHOLAS (Neo-Lat., from Gk. *φωλάς*, a lurking mollusk which makes holes in stones). A genus of bivalve mollusks having much roughened, file-like shells with which they excavate cavities in soft rocks, in other shells, etc., for their own occupancy. See DATE-SHELL.

PHO'LUS. A centaur, son of Silenus, by whom Hercules was entertained on his journey in quest of the Erymanthian Boar. When the other centaurs were attracted to the cave of Pholus by the odor of the wine with which he regaled the hero, Hercules scattered and pursued them, but on his return found Pholus accidentally killed by one of the arrows which he had withdrawn from the body of a slain centaur, and which had dropped from his hand and stuck in his foot.

PHONAUTOGRAPH. See PHONOGRAPH.

PHONETIC LAW (Gk. *φωνητικός, phōnētikos*, relating to sound, from *φωνή, phōnē*, sound, voice; connected with *φῆναι, phēnai*, Lat. *fari*, to speak, OHG. *ban*, Ger. *Bann*, AS. *bann*, Eng. *ban*). In comparative linguistics, a formula which sums up a certain phonetic correspondence or a certain number of such correspondences. The term law in this sense is, therefore, essentially different from its application in mathematics or chemistry, and approaches rather the usage of the word as it is employed in psychology. A given phonetic law, moreover, is required to be operative only under given conditions in a given dialect or dialect group during a given period. As an example of such a law we may take the representation of the Indo-Germanic *ā* which becomes in Germanic *ō*, which remains unchanged in Gothic, Icelandic, Old Saxon, and Anglo-Saxon; as Sanskrit *bhrātar*, Greek *φράτηρ*, Latin *frāter*, 'brother,' but Gothic *brōþar*, Icelandic *brōþer*, Old Saxon *brōthar*, Anglo-Saxon *brōþor*. Further, it is a phonetic law in Old High German that such an *ō* becomes *uo*, which is changed in New High German to *ū*, so that we find corresponding to Gothic *brōþar*, Old High German *bruodar*, New High German *Bruder*. On the other hand, Indo-Germanic *ā* becomes *a* in Old Church Slavic and *ō* (written *o*) in Lithuanian, as Sanskrit *bhrātar*, 'brother,' Old Church Slavic *bratŭ*, Lithuanian *brõlis*. As the science of comparative linguistics developed, it was found that sound-changes followed certain rules. The very earliest investigators, however, seem to have paid little attention to the problem whose enunciation and discussion was destined to mark an epoch in the history of the science, the question as to the invariability of phonetic law. Yet even then it was realized that etymology (q.v.) without strict adherence to phonetic law was capricious and unscientific. The existence of such law was emphasized by the famous discovery known as Grimm's law (q.v.), which was in its turn supplemented and accentuated anew by the enunciation of Grassmann's law (q.v.), Verner's law (q.v.), and the palatal law, which postulated the existence of *e* in Pre-Indo-Germanic. In 1876 the logical result of phonetic investigations up to that time was given by Leskien, when he stated the theorem that phonetic laws know no exceptions. This was the keynote of the neo-grammarian movement. (See PHILOLOGY.) Osthoff and Brugmann two years later stated the principle in its definite form as follows: "All sound-change, in so far as it operates mechanically, is carried out according to invariable laws." By this modification of Leskien's statement the necessary scope was given for analogy (q.v.) in controverting the action of the laws. Exceptions were, therefore, only apparent, not real, and they were to be explained either by the operation of analogy or as the results of laws yet undiscovered. This latter point had already been emphasized by Leskien, as Whitney had laid stress on the importance of analogy in explanation of many difficult linguistic phenomena. The point at issue was unfortunately shifted, and the gulf between the old and new schools of grammarians widened almost hopelessly. The contention became not the nature of phonetic law, wherein all might, it would seem, be in harmony, but whether the laws were invariable or not, a problem which is yet unsolved. Without going into the details of the long discussions which followed after 1878, where Georg Curtius and Brugmann were the protagonists for the old and new schools respectively, it may be said that the net result has been a distinct gain for the neo-grammarian movement. Phonological and etymological investigation at present tacitly accepts the invariability of phonetic law. At the same time, it is not as rigidly bound by dogmatic adherence to this principle as was the case when the enthusiasm of its novelty was potent. The influence of the doctrine has, then, been most beneficial in enforcing accuracy in the application of the laws, and compelling exact and full explanation of any deviation, however slight, from their normal action. On the other hand, sufficient attention has not yet been devoted to the explanation of the laws themselves. Why, for instance, to revert to the example already given, does Indo-Germanic *ā* become *ō* in certain languages, *a* in others, and in others still remain unchanged? Phonetic changes, instead of being absolutely invariable, are only relatively uniform and obey only general tendencies. These tendencies are governed to a large extent by physiological requirements, and further by psychological processes, especially the associative faculties of analogy, imitation, and the like. Initially the changes are individualistic. If the phonetic change in question is physiologically possible and pleasing to a speech-community, however small, it may be adopted imitatively, and may then be extended analogi-

cally, and being accepted by a widening range of speakers, it may develop into a general tendency, become relatively uniform, and thus be made a phonetic law. These conclusions are confirmed by the study of living, spoken dialects, where the artificial uniformity of script does not mislead the investigator, as is too often the case with languages which have been preserved only in literary forms.

Consult: Curtius, *Zur Kritik der neuesten Sprachforschung* (Leipzig, 1885); Brugmann, *Zum heutigen Stand der Sprachwissenschaft* (ib., 1885); Schuchardt, *Über die Lautgesetze* (Berlin, 1885); Delbrück, *Einleitung in das Sprachstudium* (3d ed., Leipzig, 1893); Paul, *Prinzipien der Sprachgeschichte* (3d ed., Halle, 1898); Oertel, *Lectures on the Study of Language* (New York, 1901). See GRASSMANN'S LAW; GRIMM'S LAW; PHILOLOGY; PHONETICS; VERNER'S LAW.

PHONETICS. In its broadest sense, a study of the whole range of sounds, articulate, musical, and otherwise. It is, however, usually confined to the articulate sounds of human speech. Even in this restricted sense, it is still broad enough to include the subject of the purely acoustic or mechanical side and the anthropological or philological side. It may discuss simply the vibrations that cause any particular sensation on the human ear, or it may include an investigation of the manner and causes of the change of one articulate sound in one language at one time, into another sound in another language or at another epoch. In the first case it should consider the mechanism and methods by which the sounds are produced, and also the way in which they are made effective in the ear, and impress the brain.

The question of the variations of articulate sounds and of the symbols which from time to time may be used to represent them belongs to the sphere of comparative philology (q.v.), and is not, therefore, discussed in this article.

Confining the attention to the physics of phonetics, the subject naturally falls under three heads, or questions: What is tone quality, or the mechanical difference between two sounds? How are sounds produced in the human voice? and How are they perceived in the ear? The divisions may best be treated in the order given.

One sound differs from another in three factors, pitch, intensity, and quality. (See ACOUSTICS.) The pitch and intensity, or loudness, are of but little importance in this connection. The controlling factor is the quality. In articulation the sounds are divided into two broad classes: the vowel sounds, or those which are maintained in more or less uniform quality for an appreciable length of time; and the consonants, or those sounds which are more essentially a peculiar stopping or starting of a vowel sound, and which are apt to form the transition from one vowel to another, by some one of an infinite variety of ways.

Taking up the discussion of the vowel sounds first as being the simpler case, it is evident that these sounds, which last with a uniform character for an appreciable fraction of a second, or at least may be so prolonged, must depend for their distinguishing peculiarities upon the same factors as any other sound. As the pitch of a sound depends upon the length of the wave, and the intensity upon the height of the wave, so does the quality of the sound depend upon the shape of the wave. It has been demonstrated that any wave motion, no matter how complex, may be considered as made up of a series of simple waves of differing lengths and heights. Therefore, any quality of sound, no matter how complex, is made up of simple components, differing in pitch and intensity. By a simple sound is meant one in which the vibrating particles move in a simple harmonic motion, similar, for example, to that executed by a clock pendulum. When a violinist plays a particular note, it differs from the same note on the organ or the piano or the wind instruments only in the relative number, intensity, and pitch of the 'partials' or 'overtones' which accompany the fundamental, or 'pitch-tone.' In a manner entirely analogous the maintained sounds of the human voice differ one from another, when the same fundamental tone is being produced, only in the relative number, pitch, and intensity of the accompanying partials. It is believed by some that the 'phase-relation' of the components also affects the quality of the sound, but this is still an open question and certainly does not affect the case of articulation.

The question, then, is to determine just what are the particular combinations of elements which form the various vowel sounds. In the first place, it has been shown conclusively that the same relative components will not produce the same vowel sounds on different pitches. For example, a certain combination, bearing a definite relation to a fundamental of 256 vibrations per second, will produce a certain vowel quality, but if the rates of all these components are raised by the same interval of a fifth, the vowel quality will be quite different. In other words, that combination which is recognized as giving a perfectly satisfactory *a*, as in *father*, on a pitch of middle *c*, is entirely different from that which is similarly recognized on a pitch an octave higher.

There are two conceptions at present as to what constitutes the essential characteristic of a particular vowel sound. Some hold that each vowel sound always contains in its complex a certain characteristic tone component of definite pitch, and that the presence of this element makes that vowel. For example, *a*, as in *father*, has its essential vowel tone, and *e*, as in *meet*, would have a different tone. This theory holds that the pitch of the characteristic elements is constant, irrespective of the pitch of the fundamental, or main tone. Others believe that there is no difference in the question of tone quality in vowels from the same question as applied to any tone. Under this conception there would be no one essential component, but all would be essential and the total would be characteristic. This would mean that the difference between *o* and *a* pronounced on treble *c* is of exactly the same character as that between the two sounds when that note is played upon a flute and upon a violin. In other words, vowel quality is no different from tone quality.

The actual solution of this question is enormously complicated by the fact that habit allows the greatest possible variation in what may still be called a particular vowel. For example, the *a* in different individuals may differ more radically than the *a* and *o* in the same individual.

Helmholtz seems to hold to both theories, and gives the following as the pitches of the characteristic tones of the vowels: U = 175; O =

466; A = 932; Ā = 1568; Ėm = 1976; I = 2349. In like manner he gives the composition of those vowel sounds as made up of a characteristic combination of overtones, as follows:

VOWEL	1	2	3	4	5	6	7	8
I	*f*	*pp*	*pp*	.....	.....	.....	.....	.....
O	*mf*	*p*	*p*	*f*	*p*	.....	.....	.....
A (as o in not)	*p*	*p*	*p*	*p*	*ff*	*ff*	*ff*	*ff*
Ā	*p*	*pp*	*p*	*f*	*f*	.....	.....	.....
E	*p*	*pp*	*f*	*p*	*p*	*p*	*p*	*p*

The letters *p*, *pp*, *f*, *ff*, and *mf* have the usual musical significance.

Nevertheless the greatest difference of opinion exists as to the exact pitch of the characteristic tone, and also as to the particular combination of partials which form the particular vowel sounds. In general it seems well established that in the sound of *a*, as in *father*, the complex consists of the fundamental and the first eight or ten overtones with intensities decreasing as they rise in pitch. E, as in *meet*, has not the higher overtones, and is characterized by a relative strengthening of the third and fourth in the series. O, as in *moat*, has number four rather strong; and finally U, as *oo* in *boot*, is little if anything besides the fundamental and a little of the first overtone. It is to be understood that these overtones are in the series present in a string, or an open pipe, i.e. the rates of vibration of the fundamental and overtones are in the ratio of 1 to 2, 3, 4, 5, etc.

The question of the exact composition of any vowel on any pitch cannot be definitely and finally determined, for the simple reason that the character of the sound differs with every individual, and no one can be said to be right and all the others incorrect. General conclusions can be stated or specific analyses in particular cases.

As to the quality of the sounds in the pronunciation of the consonants little can be said at present, as the case is much more complex than that of the vowels. On the one hand, the quality is rapidly changing from instant to instant, thus offering new and especial difficulties to the analyst; and on the other hand, the simple more or less musical tones are often accompanied by a number of irregular noises like the hiss, the aspirate, etc. There are also the peculiar methods of stopping and starting the sounds, as in *p*, *b*, *d*, *g*, etc., in initials or finals. A class exists where a neutral sound is produced in the larynx, and formed into *m*, or *n*, or *th*, etc., according to the way in which the air is permitted to escape, by the nose or mouth.

Thus far no rigid analysis of the consonants has been possible, although the individual variations may be less than in the vowels.

The second branch of the subject is the apparatus and method of production of human articulate sounds. This function is performed by the joint action of the lungs, larynx, mouth, and nose. The lungs are simply the wind box, and serve to supply the air to actuate the vocal cords and produce the various sounds; they supply the raw material, and are the source of energy.

In the larynx (q.v.) is to be found the original source of all the sustained sounds that bear any resemblance to musical tones. Whisperings, hisses, aspirates, etc., are formed independent of the larynx. In the larynx is to be found a pair of cords or membranes, which may be so drawn together over the top of the windpipe that they practically close it. If air from the lungs is forced against the cords under the above conditions, they are set into vibration and produce a sound. The pitch of this sound is regulated by the length, weight, and tension of these cords, there being present in the larynx sets of muscles for the involuntary control of these three factors which determine the pitch of a vibrating cord. Confining the attention again to the vowel sounds, it may be said that the function of the larynx is to produce a sound which can be molded into any one of the vowels, and that its action is not determinative as to which vowel shall be produced. Articulation is not performed by the larynx, but by the agencies between it and the outer air. The particular variation of tone that is produced by an individual depends upon the cavities of the mouth and nose, the position of the various movable parts, as the tongue and palate, and the size and shape of the opening at the teeth or lips. In the flute and clarinet it is the number and location of the openings which determine the pitch to a large extent, but in the human voice it is the larynx which determines the pitch of the fundamental, and the size, shape, and openings of the cavities of the mouth and nose determine the quality of the sound, i.e. the vowel sound produced. Resonance as applied to this subject means that property of a mass of air by virtue of which it can pick up and intensify the vibrations which fall upon it when those vibrations are of a frequency bearing the proper relation to the size, shape, and opening of the air mass. The vocal cords produce a complex sound composed of a fundamental and a more or less complicated series of over tones; this sound passing out through the cavities of the mouth and nose has certain tones reënforced by virtue of the resonance of the cavities, while other components are practically smothered out from finding no means of reënforcement.

Cases are on record where the whole larynx has been removed and a silver one substituted, so arranged that a simple reed could be inserted, and the patient could articulate just as well as before, with the sole difference that he spoke always on the same fundamental pitch. The system of phonetic writing devised by Alexander Melville Bell, by means of which an expert can represent perfectly any sound, articulate or inarticulate, by simply using a set of symbols that tells the speaker how to place the parts of the mouth, and how to use the breath and voice, is a practical proof that articulation proper is done above the larynx. Evidence in this case is also furnished by the methods of teaching deaf mutes to speak and to some extent by their ability to tell the meaning from the motions of the lips. Individual or race peculiarities of pronunciation may, of course, be due to peculiarities in the dimensions and character of the vocal cords and larynx, as well as to the cavities of the mouth and nose,

etc., but these elements are persistent and affect the voice accordingly.

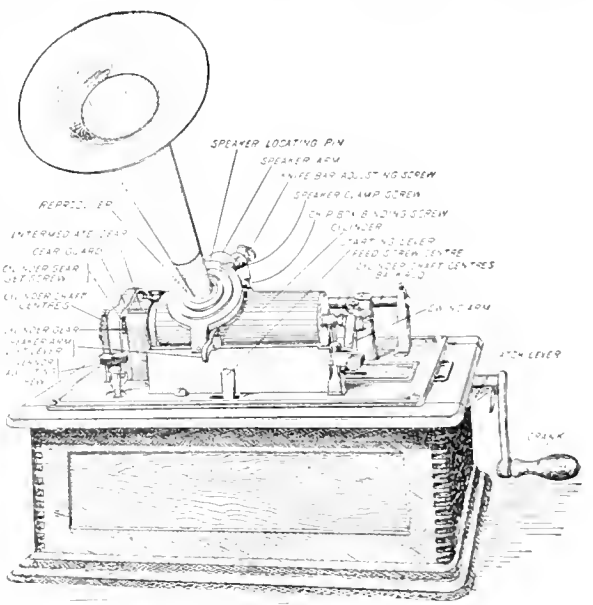
The third and last element that must be considered under the physics of phonetics is the sound-receiving apparatus of the human being. The ear (q.v.) consists of three essentially different parts: the interior ear, where are situated the nerves which perform the actual hearing; the intermediate ear, consisting of a series of little bones which transmit the vibrations of the ear drum to the nerves within; and finally the drum and external ear. The drum takes up the vibrations which fall upon it, and transmits them to the nerves. All of these parts have little or no effect upon the quality of the sound perceived, provided the ear is well and normal. The external ear, however, acting as a collector of the air vibrations and concentrating them upon the drum, does to some extent act as a resonator and distort the quality of the sound produced. This is practically constant for an individual and is not noticed, but it may vary considerably in different individuals, and hence the same sound complex may seem really different to two individuals by the time it reaches the real hearing mechanism.

BIBLIOGRAPHY. The standard work is Sievers, *Grundzüge der Phonetik* (5th ed., Leipzig, 1901), which has a full bibliography. Consult also: Bell, *Visible Speech* (London, 1867); Ellis, *Early English Pronunciation* (ib., 1869-89); Sweet, *Hand-book of Phonetics* (Oxford, 1878); Techmer, *Phonetik* (Leipzig, 1880); Meyer, *Organs of Speech and Their Application in Formation of Sounds* (London, 1883); Trautmann, *Die Sprachlaute im allgemeinen und die Laute des Englischen, Französischen und Deutschen im besondern* (Leipzig, 1884-86); Sweet, *A History of English Sounds from the Earliest Period* (2d ed., Oxford, 1888); Bell, *World English* (London, 1888); Rousselot, *La méthode graphique appliquée à la recherche des transformations inconscientes du langage* (Paris, 1891); Passy, *Etudes sur les changements phonétiques et leurs caractères généraux* (ib., 1891); Weeks, "A Method of Recording the Soft Palate Movements in Speech," in *Harvard Studies and Notes in Philology and Literature*, vol. ii. (Boston, 1891); Brenner, *Deutsche Phonetik* (Leipzig, 1893); Bell, *Sounds and Their Relations* (2d ed., Washington, 1894); Lloyd, "Speech Sounds: Their Nature and Causation," in *Phonetische Studien*, vol. iii. (Marburg, 1898); Vietor, *Elemente der Phonetik des Deutschen, Englischen und Französischen* (4th ed., Leipzig, 1898); Soames, *An Introduction to Phonetics* (London, 1899); Scripture, *The Elements of Experimental Phonetics* (New York, 1902).

PHONETIC SPELLING. Spelling according to sound. See ORTHOGRAPHY; SHORTHAND; SPELLING REFORM.

PHONETIC WRITING. Writing according to sound. In the case of languages which have not previously been reduced to writing and thus acquired a stereotyped orthography, phonetic writing is necessarily regularly employed. In this way many Polynesian, African, and American Indian dialects have received a written form. In languages which already possess an established orthography, phonetic writing is employed either in shorthand or in so-called spelling reform. In the former case the phonographic shorthand signs are afterwards transliterated into the conventional orthography. In the latter instance the sound as heard by the writer is preserved at the expense of the etymology and very frequently of consistency, the same word often being variously written in phonetic spelling by different writers, and with a more or less cumbrous system of arbitrary diacritical letters. In indicating the exact pronunciation of words whose orthography does not represent the sound, some exact system of phonetic writing is usually employed. See ORTHOGRAPHY; SHORTHAND; SPELLING REFORM.

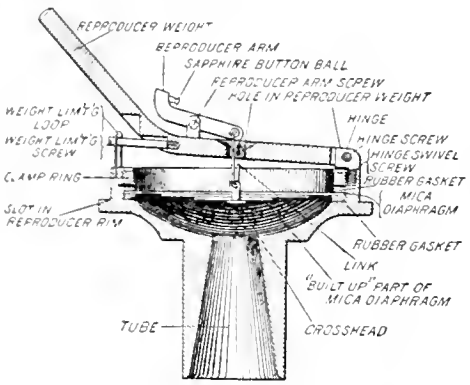
PHONOGRAPH (from Gk. *φωνή, phōnē*, sound, voice + *γράφειν, graphein*, to write). The first mechanical device for the registering and reproduction of speech or other sound was the invention of Leon Scott, known as the phonautograph and constructed in 1855. It consisted simply of an ellipsoidal barrel. In this apparatus the sound receiver was open at one end and closed at the other. From the closed end projected a



EDISON PHONOGRAPH.

small tube, across which was stretched a flexible membrane, to the centre of which by means of sealing wax was affixed a bristle, which acted as a stylus, and vibrated with the membrane. In front of the membrane was placed a horizontal cylinder, which was wrapped with a sheet of paper, covered with a thin layer of lampblack, against which the bristle rested lightly. Any sound vibrations entering the ellipsoid were transmitted by the membrane to the stylus, which, when the cylinder was made to revolve, and to advance slowly, described on the lampblack surface a zig-zag line which was thus practically a phonographic record of whatever vibrations had been produced.

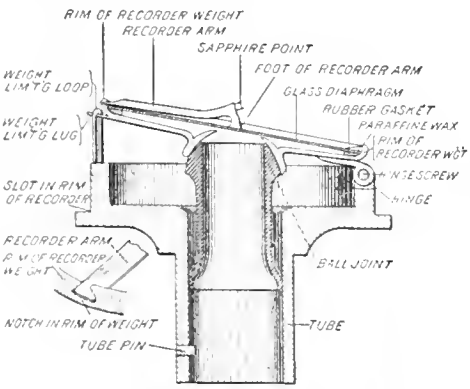
The invention of Leon Scott embodies the essential principles on which recording and reproducing instruments of the present day are based. It now we substitute a receiving funnel for the ellipsoid, a more rigid or metal stylus for the bristle, and a tin-foil covered cylinder for the lampblack one, we have the phonograph of Thomas A. Edison, as it was originally constructed in 1877; with this essential difference, however, that the sound vibrations were now indented instead of being traced. By reversing the machine—that is, causing a blunt stylus to travel over the indentations made, the original sound was reproduced. Great expectations were entertained of this invention at the time; but it



SECTION OF REPRODUCING APPARATUS OF EDISON PHONOGRAPH.

was found that after a few repetitions the record became effaced from the tin foil and the invention proved to be scarcely more than an interesting toy.

During the year 1888 Mr. Edison placed upon the market a phonograph which was a far more elaborate machine as well as more practical than any of its predecessors. The tin-foil gave place to a wax cylinder, which, as shown in the illustration, is slipped over and held on a mandrel. The recording and reproducing devices differ slightly and are shown in the accompanying figures. In operating, the wax cylinder is made to revolve. In talking into the funnel, the malle-



SECTION OF RECORDING APPARATUS OF EDISON PHONOGRAPH.

able glass diaphragm, with a cutting stylus on its under surface, is made to vibrate, and a register of the sound is thus cut vertically into the wax, the cutting stylus advancing horizontally as the cylinder revolves. In reproducing, another diaphgram, which differs from the first in that it has a different tool and is made of sheets of mica, is employed. The cutting or recording stylus consists of a sapphire with a cup-shaped front which is ground to a fine edge. The reproducing stylus, on the other hand, has a ball-shaped point. This stylus follows the track cut out by the recording stylus. Its motion causes the diaphragm to vibrate, and thus to reproduce the original sound. The machine gets its power from a small electric motor or spring. The sound thus reproduced is not at all equal in volume to the original, but may be strengthened by means of a funnel attached to a reproducer, and by adjusting the speed of the machine sounds may be given out with sufficient loudness to be heard by all in a room. In using a cylinder that already contains a phonographic record, a sharp knife precedes the cutting stylus, thus removing the previous record. A record once made can be reproduced several thousand times without perceptible impairment of its quality, and a record made on one machine can be reproduced on another, thus admitting of the cylinder's being used for mailing, as in ordinary correspondence. There is no limit to the speed with which sounds can be recorded, nor to the number and variety of sounds. The difficulty of concentrating the sounds upon the diaphragm is surmounted in factories where musical and other records are constructed by grouping together the persons or instruments whose sound is recorded. By increasing the speed of the cylinder the pitch is raised, and by lessening it the pitch is lowered. See GRAMOPHONE.

PHONOGRAPHY. See SHORTHAND.

PHO'NOLITE (from Gk. *φωνή, phōnē*, sound, voice + *λίθος, lithos*, stone). An igneous rock of porphyritic texture which has a chemical composition essentially equivalent to nephelene syenite (q.v.), and generally contains porphyritic crystals of feldspar (sanadine) and nephelene. Most phonolites have been poured out at the surface of the earth as lavas; as, for example, in the Auvergne of Central France, and in the Cape Verde Islands. Many phonolites possess a platy parting or separation by cracks into a series of parallel plates, so that they give out a peculiar sound when struck with a hammer. On this account they were formerly known as clinkstones. More subject to alteration from atmospheric agencies than most other rocks, they soon lose their fresh appearance, and frequently show the development of crystals of the zeolite minerals.

PHO'RADEN'DRON. An American plant. See MISTLETOE.

PHOR'BAS (Lat., from Gk. *Φόρβας*). (1) A son of Lapithes and Orsinome, who freed Rhodes from snakes and was honored by the inhabitants as a hero. He was called *ophiuchus* (the snake-holder) and given a place among the stars. In another legend, Alector, King of Elis, secured his assistance against Pelops, and gave him his daughter, sharing the kingdom with him. (2) A companion of Æneas. The god of sleep assumed his form in order to deceive Palinurus.

PHOR'CUS, PHORCYS, or **PHORCYN.** In Greek mythology, an aged divinity of the sea. Hesiod and others make him the son of Pontus and Gæa, and brother of Nereus and Ceto. By

the latter he became the father of the Graces and Gorgons, who are hence called Phorcides or Phoreydes. He was also the father of the nymph Thoosa, who became the mother of Polyphemus, the Hesperides, and the Sirens.

PHORMIO. A lively and interesting comedy by Terence, produced in B.C. 161. It takes its name from the parasite in the play, which was modeled on the Ἐπιδικαζόμενος of Apollodorus. From this comedy Molière drew the plot of his *Fourberies de Scapin*.

PHORO'NIS (Neo-Lat., from Gk. Φορωνίς, relating to Phoroneus, from Φορωνεύς, *Phorōneus*, Phoroneus, an ancient Greek King of Argos). A marine worm-like animal recently decided to be in a class by itself (Phoronidea). It lives socially, each worm inclosed in a membranaceous or leathery tube. The body is long, slender, not segmented, and around the mouth is a crown of long delicate ciliated tentacles borne on a horseshoe-shaped lophophore. It is hermaphroditic, developing from eggs, and never asexually from buds. The larva is very remarkable: it is a modified trochosphere, and is called an 'actinotrocha.' It may be recognized by the large hood-like lobe overhanging the mouth, while there is a post-oral circle of large ciliated finger-like tentacles; it rapidly metamorphoses into the polyzoön-like adult. It occurs on the coasts of Northern New England and in Europe, while another species inhabits the Australian seas. Consult Harmer, *Cambridge Natural History*, vol. ii. (London, 1899).

PHORORHACHOS, fō'rō-rā'kōs (Neo-Lat., from Gk. φορά, *phorá*, motion, from φέρειν, *pherein*, to bear + ῥαχός, *rhachós*, brier). A gigantic extinct running bird of prey, skeletons of which are found in the Miocene deposits of Patagonia. It was about 8 feet in height and its skull was larger than that of a horse and armed with a strong hooked beak like that of an eagle. The wings were small and useless, and the legs long and strong and provided with powerful talons. It appears to have been a swiftly running bird, like the ostrich, though actually related to the herons. Consult Lucas, *Animals of the Past* (New York, 1901).

PHOSGENE GAS (from Gk. φῶς, *phōs*, light + -γενής, *-genēs*, producing, from γίγνεσθαι, *gignesthai*, to become), CARBONYL CHLORIDE, or OXYCHLORIDE OF CARBON, $COCl_2$. A colorless suffocating gas which is formed by exposing equal volumes of carbonic oxide and chlorine to the action of sunlight. If brought into contact with water, phosgene gas rapidly decomposes into carbonic and hydrochloric acids. It may be readily condensed to a liquid, boiling at 8° C. It is largely used in chemical laboratories, as it readily reacts with various substances, so that many organic syntheses can be carried out with the aid of it. It is also employed in the manufacture of certain coal-tar dyestuffs. Phosgene was first prepared by J. Davy in 1811, its name indicating that it was formed under the influence of light.

PHOSPHATES (from *phosphorus*) (in physiology). The following phosphates play an active part in the chemistry of the animal body.

Phosphate of soda occurs in three forms, Na_3PO_4, Na_2HPO_4, and in NaH_2PO_4, called respectively the basic, neutral, and acid salts. These are all soluble in water. By exposing the second of these salts to a red heat *pyrophosphate* of soda, $Na_4P_2O_7$, is formed, and by similarly treating the third, *metaphosphate*, $NaPO_3$, results. Phosphate of soda in one or the other of the above forms is a constituent of all the fluids and soft tissues of the body, and is especially abundant in the urine and bile. Pyrophosphate and metaphosphate of soda are found in the ashes of animal tissues after incineration, but they result merely from the action of heat on the neutral and acid salts. The salts of sodium are always associated with the corresponding salts of potassium, and what is said of the derivation, elimination, and physiological importance of the one is equally applicable to the other. The alkaline phosphates obviously are derived from the food, being either ingested as such or converted within the organism from other alkaline salts. Elimination is effected chiefly through the kidneys and intestinal canal. In the carnivorous animals, whose blood is much richer in phosphates than that of herbivora (the ash of the blood of the dog, for example, contains from 12 to 14 per cent. of phosphoric acid, while that of the ox or sheep does not contain more than from 4 to 6), these salts are carried off by the urine; but in consequence of the formation of free acids as products of the disintegration of the tissues, a portion of the base is abstracted from the originally alkaline phosphates, and a corresponding portion of phosphoric acid is liberated. The originally alkaline salt is thus rendered neutral or even acid; and the occurrence of the acid phosphate of soda, NaH_2PO_4, in the urine is thus explained. In the herbivorous animals, on the other hand, the urine contains no phosphates, the whole of the phosphoric acid taken in their food being eliminated by the intestinal canal in the form of the insoluble phosphates of lime and magnesia. Although the general distribution of the phosphates of the alkalies in the nutrient fluids (there is 40 per cent. of them in the ash of the blood-cells; 28.4 per cent. of phosphoric acid and 23.5 of potash in the ash of cow's milk; and about 70 per cent. of phosphoric acid in the ash of the yolk of egg) is in itself an indication of their importance, the exact nature of their functions is not completely understood. Liebig has specially drawn attention to the peculiar grouping of the acid and alkaline fluids of the animal body. The permanence of this grouping is chiefly maintained, especially in herbivorous animals, by the conversion within the body of alkaline and neutral phosphates into acid phosphates by the means already described. Moreover, all tissue-forming substances (the protein bodies) are so closely connected with phosphates that they remain associated during the solution and subsequent reprecipitation of these substances; and the ash of developed tissues (such as muscle, lung, liver, etc.) always affords evidence that acid phosphates existed in the recent tissue; and, further, no exudation from the blood-vessels can undergo transformation into cells and fibres, or, in other words, become organized, unless phosphates are present. Another proof of the share taken by the phosphates in the formation and functions of tissue is the fact that, although herbivorous animals take up a very small quantity of phosphates in their food, and although their blood is very poor in these salts, their tissues contain as large a proportion of phosphates as the corresponding parts of car-

nivera. Lastly, the fact that one equivalent of the alkaline phosphate of soda, Na_2HPO_4, possesses the property of absorbing as much carbonic acid as two equivalents of carbonate of soda, leads to the belief that the power of attracting carbonic acid, which the serum of the blood possesses, is due as much to the phosphate as to the carbonate of soda, and that, consequently, phosphate of soda plays an important part in the respiratory process.

Phosphate of lime occurs in the organism in three forms, viz.: as the normal calcium phosphate, $Ca_3(PO_4)_2$, the monocalcic calcium phosphate, $Ca(H_2PO_4)_2$, also called acid phosphate, and the dicalcic phosphate, $Ca_2(HPO_4)_2$. The normal phosphate occurs in all the solids and fluids of the body, but is most abundant in the bones, in which it amounts to about 57 per cent.; and in the enamel of the teeth, in which it ranges from 80 to 90 per cent. It may at first sight appear inexplicable how a salt so perfectly insoluble in water as normal phosphate of lime can be held in solution in the animal fluids. In some fluids, as the blood, it is probably, in part, at least, combined with albumen, with which it forms a soluble compound; while in other fluids, as the urine, it is held in solution by a free acid or by certain salts (as, for example, chloride of sodium), whose watery solutions are more or less able to dissolve it. When too small a quantity of this salt is taken with the food, the bones lose more or less of their hardness and firmness, and fractures do not readily unite. Phosphate of lime, like the phosphates of the alkalies, is indispensable to cell formation; and in the mantle of the mollusks (where new cells for the formation of shell abound) this salt is far more abundant than in any other part of the body. Although by far the greater quantity of the phosphate of lime found in the body has doubtless preëxisted in the food, yet it is unquestionable that a part of it is formed within the organism by the action of carbonate of lime on the phosphoric acid that is formed during the disintegration of the phosphorus containing tissues, such as the brain. In man and carnivorous animals, a certain portion of the phosphate of lime is eliminated by the kidneys, and the rest is carried off in the excrements; while in herbivorous animals the whole is carried off in the excrements. The acid phosphate of lime is occasionally found in the urine of man and carnivorous animals, but is of no practical importance. For the amount of earthy phosphates daily eliminated by the kidneys, see URINE.

Normal phosphate of magnesia, $Mg_3(PO_4)_2$, is analogous, both in its chemical and physiological relations, to the corresponding salt of lime, with which it is always associated. The abundance of this salt in cereals and vegetables explains its presence in the system. A far less amount of this salt than of the corresponding lime-salt seems to be required by the organism, as is shown by the relative quantities in which they occur in bone (.57 of the former to 1.3 of the latter), and as is further indicated by the fact that, relatively, far more of this than of the lime-salt escapes intestinal absorption, and appears in the excrements.

The only phosphates remaining to be noticed are the *phosphate of ammonia and magnesia*, or triple phosphate, $MgNH_4PO_4 + 6H_2O$, which occurs in beautiful prismatic crystals in alkaline urine and urine that is beginning to putrefy, and the *phosphate of soda and ammonia*, which is occasionally found as a crystalline sediment in putrid urine.

PHOSPHATIC DIATHESIS, or PHOSPHATURIA. The excretion in excessive amounts of the earthy salts of phosphoric acid in the urine. Phosphoric acid is excreted in combination with the alkaline bases, sodium and potassium, and the earthy bases, calcium and magnesium. The alkaline phosphates form about two-thirds of the whole, and are always held in solution; the earthy phosphates form about one-third and are spontaneously precipitated under certain circumstances as phosphatic deposits and calculi. One of the causes of such deposition is an alkaline condition of the urine. The urine in health may be temporarily alkaline from eating much fruit or vegetables containing citrates, tartrates, or malates of potassium and sodium. These are converted into carbonates in the intestines and absorbed as such into the blood, and diminish the acidity of the urine or render it alkaline. The urine is sometimes turbid from a white deposit of the amorphous calcium phosphate ($Ca_3P_2O_8$). This may be mixed with a crystalline phosphate ($CaHPO_4 + 2H_2O$), the so-called stellar phosphate, or a phosphate of magnesia ($Mg_3P_2O_8$). A more common condition, however, is that observed when a feebly acid or neutral urine is heated and a thick white deposit or turbidity occurs. In urine which has undergone ammoniacal fermentation there occurs a precipitate of the ammonio-magnesium or triple phosphate ($MgNH_4PO_4 + 6H_2O$), in the form of minute triangular prisms.

It has been thought that there is a relation between the activity of the nervous system and the excretion of phosphoric acid. An increased amount is seen in the urine after excessive mental work or worry. This phenomenon is also observed in many diseases characterized by wasting and debility, such as phthisis, leucocythæmia, acute yellow atrophy of the liver, and severe anæmias. The old term 'phosphatic diathesis,' signifying a constitutional tendency or habit of body that produced or promoted a deposition of the phosphates from the urine, is no longer recognized.

PHOSPHATIC FERTILIZERS. See MANURES AND MANURING.

PHOSPHINE. See PHOSPHORUS.

PHOSPHOR-BRONZE. An alloy consisting of copper, zinc, and tin in various proportions, with a small quantity of phosphorus which has been introduced in the form of phosphor-tin. The addition of phosphorus has the effect of eliminating the oxides, and, by causing the tin to assume a crystalline structure, increases the homogeneity of the alloy, and thereby its elasticity and absolute resistance. In consequence, phosphor-bronze has met with considerable demand where special strength or power of resisting wear is required, as in the case of bearings for quick-running machinery.

PHOSPHORESCENCE. It has been observed that many bodies continue to emit light in a darkened room after having been exposed to sunlight or some other strong source of light. This phenomenon is called phosphorescence. Although the name is evidently derived from 'phosphorus,'

it should be noted that the cause of the luminosity of phosphorus is a slow oxidation, and is not due to its having been previously exposed to light. Phosphorescence itself is a special case of fluorescence (q.v.), and cases where there are permanent chemical changes are excluded. Those substances which phosphoresce most brilliantly are the sulphides of barium, calcium, and other alkaline earths, diamonds, sugar, etc. It has been found that the phosphorescent light is often brilliantly colored, and also that the color of the light to which the body is exposed in order to excite phosphorescence has a very important influence upon the intensity of the phosphorescent light itself. It is observed that the same law connecting the exciting light and the phosphorescent light holds true as was noted in the case of fluorescence, namely, that the phosphorescent light is of a longer wave-length than the exciting light. A distinction has been drawn between phosphorescence and fluorescence from the fact that only fluids exhibit fluorescence, while only solid bodies exhibit phosphorescence. Nearly all bodies which show fluorescence will show phosphorescence when in the solid state, as, for instance, if when liquid they are dissolved in gelatin and then dried. One of the earliest and most important investigations of phosphorescence was made by E. Becquerel, who made a special study of the interval of time phosphorescence would continue after the phosphorescing body was removed from the light. He invented an instrument known as the phosphoroscope, which enabled him to measure with the greatest exactness the small intervals of time involved in the phenomena. He observed that many bodies in which by ordinary means of observation there was no trace of phosphorescence can be shown to phosphoresce for minute fractions of a second. For instance, after exposure to sunlight, calcite shines with orange-colored light; aragonite gives a greenish light, as does lead glass also; uranium glass shines with a greenish light which lasts for about one-thirtieth of a second, although it has its maximum intensity at about one three-hundredth of a second after the sunlight has been withdrawn. Sapphires and rubies give a brilliant pure red light, as do almost all the minerals which contain aluminum.

One most interesting feature of phosphorescence is that if a body is phosphorescing, as for instance a piece of paper covered with Balmain's paint, the application of heat at any one point will destroy the phosphorescence there. This evidently furnishes a method for the study of those portions of the spectra which lie in the infra-red region; i.e. those wave-lengths which are too long to affect our sense of sight. For if a strip of paper covered with Balmain's paint is exposed to sunlight for a short time and then taken into a darkened room and so placed that the infra-red spectrum coming from any source falls upon the paper, those places where there is radiation will be made manifest by the disappearance of phosphorescence owing to the heating effect of the rays of the spectrum. This procedure has been improved by Draper and Lommel, and now forms one of the best methods used in spectrum analysis. See LIGHT: FLUORESCENCE.

PHOSPHORESCENCE OF THE SEA. See LUMINOSITY OF ANIMALS.

PHOSPHORIC ACID, H_3PO_4. An acid compound of phosphorus, hydrogen, and oxygen, first obtained by Scheele in 1777. It may be prepared by cautiously heating yellow phosphorus with dilute nitric acid for several hours and driving off the excess of nitric acid by heat. Pure phosphoric acid is a colorless crystalline substance melting at about 41° C. It is a tri-basic acid, the three hydrogen atoms in its molecule being replaced gradually and the result being three series of salts, like NaH_2PO_4, Na_2HPO_4, and Na_3PO_4. The 'neutral' salts of the alkali metals have a strongly alkaline reaction. When heated above 300° C. phosphoric acid is converted into pyrophosphoric acid, $H_4P_2O_7$, which was first prepared by Gay-Lussac in 1829. Several of the salts of phosphoric acid are used in medicine. The most important phosphates are described under the names of the metals. See also PHOSPHORUS.

PHOSPHORITE. The massive, concretionary, and mammillary form of apatite, especially the variety found in Estremadura, Spain. The name was first used by Kirwan in describing the phosphates found in Spain, which occur in veins and in pockets in the Silurian schists.

PHOSPHOR'OSCOPE (from Lat. *phosphorus*, Lucifer, phosphorus + Gk. σκοπεῖν, *skopein*, to behold). An apparatus invented by Becquerel for measuring the duration of phosphorescence in different bodies. See PHOSPHORESCENCE.

PHOSPHOROUS ACID, H_3PO_3. A di-basic acid formed by the action of water on trichloride of phosphorus. It is a crystalline substance melting at 70° C. Its salts are termed phosphites.

PHOSPHORUS. One of the non-metallic chemical elements. It was discovered by Brand, a Hamburg alchemist, in 1669, while experimenting with urine with a view to preparing a liquid for the transformation of silver into gold. Kunckel, on learning of the discovery, without, however, knowing the method, invented a process of his own for the extraction of phosphorus from urine, and in 1678 published a work entitled *De Phosphoro Mirabili*. The existence of phosphorus in bones was discovered either by Gahn (about 1769) or by Scheele (1771), and subsequently phosphorus became a well-known and cheap substance, variously called Brand's phosphorus, Kunckel's phosphorus, Krafft's phosphorus, Boyle's phosphorus, and English phosphorus, while the name phosphorus, unqualified, was applied to phosphorescent substances in general until the antiphlogistic nomenclature introduced the present usage. The elementary nature of phosphorus was first recognized by Lavoisier. See CHEMISTRY.

Phosphorus does not occur free in nature, but is found abundantly in the form of phosphates. The minerals of the apatite group (combinations of calcium phosphate with calcium chloro fluoride), struvite, vivianite, wavellite, and many other minerals contain considerable amounts of chemically combined phosphorus. But the principal source of phosphorus is still the substance of bones, which consists chiefly of the neutral phosphate of calcium. Calcium phosphate is also the chief constituent of coprolites and guanos, and calcium and magnesium phosphates are found in the ashes of plants. Ammonium-magnesium phosphate is the chief constituent of urinary sediments, while in combination with carbon, hydrogen, oxygen, and nitrogen, phosphorus is found in

the yolk of eggs, in the blood and other animal fluids, and in the substance of the brain and nerves.

To obtain phosphorus, bones are burned to destroy their organic matter and are treated with sulphuric acid, which converts the neutral phosphate $Ca_3(PO_4)_2$ into the soluble acid phosphate, $CaH_4(PO_4)_2$. The solution of the latter is evaporated to dryness, charcoal is added to the residue, and the mixture is strongly heated, when two processes take place in immediate succession, the first consisting in the transformation of the acid calcium phosphate into calcium metaphosphate, $Ca(PO_3)_2$, the second in the partial decomposition of the metaphosphate by the charcoal, resulting in the formation of free phosphorus, some neutral calcium phosphate, and carbonic oxide gas. The phosphorus vapors are condensed under water in suitable vessels of clay. The crude product thus obtained may be somewhat purified by melting under water and pressing through porous plates. Arsenic, an impurity usually introduced with the sulphuric acid employed in the manufacture of phosphorus, may be removed by means of nitric acid. When pure, the phosphorus is melted and cast in the form of sticks by sucking it into glass tubes and allowing to solidify.

The chemical symbol of phosphorus is P; its atomic weight is 31. The properties of free phosphorus are not always the same, the element being capable of existing in several different allotropic forms. (See ALLOTROPY.) The vapor of phosphorus has invariably the same density, leading to the molecular formula P_4. (See MOLECULES, MOLECULAR WEIGHTS.) Experiment leads to the view that when dissolved in benzene phosphorus has a similar constitution. But the remarkable differences between the liquid and the several solid modifications of the element are by no means understood. Common or yellow phosphorus, which is ordinarily obtained by the manufacturer, is a transparent waxy substance that may be prepared in the form of crystals of the regular system by sublimation or by crystallization from solutions in carbon disulphide, in which the other varieties of phosphorus are insoluble. Its melting point is 44.5° C. and its specific gravity at 0° C. is 1.837. It phosphoresces in the dark, and although it has been shown to exhibit this phenomenon when kept in gases incapable of reacting with it, it is quite certain that in all such cases the phosphorescence is caused by the presence of traces of oxygen, which oxidizes yellow phosphorus very readily. As a matter of fact, when kept in a vacuum or in gases which have been thoroughly freed from oxygen, phosphorus gives off no light. In the air, at ordinary temperatures, yellow phosphorus undergoes slow oxidation (see OZONE), and may readily take fire even if carelessly rubbed. It may be caused to burn under water by gently warming the latter and passing a current of oxygen into it. Besides, yellow phosphorus is extremely poisonous. It must therefore be handled with great care. The use of phosphorus for matches is well known. (See MATCHES.) *Red phosphorus* was discovered by Schrötter, of Vienna, in 1845. It is gradually formed by the action of light, especially violet rays, on common phosphorus, but may be conveniently prepared by simply heating the latter to about 250° C. (450° F.), in an atmosphere of carbonic acid, nitrogen, or some other inert gas. If heated to about 300° C., red phosphorus is reconverted into the common yellow modification. The specific gravity of red phosphorus is about 2.14, and it does not melt. It does not phosphoresce in the dark, is not poisonous, and is in every way perfectly harmless. (See MATCHES.) *Crystalline* ('metallic') *phosphorus* is formed during the solidification of molten amorphous phosphorus. It may be obtained in the form of long red tabular crystals having a distinct metallic lustre. Its specific gravity is 2.34. *Black phosphorus* is formed when melted yellow phosphorus is rapidly cooled. Two other allotropic varieties of phosphorus have been described, but deserve no mention here.

COMPOUNDS OF PHOSPHORUS. Phosphorus forms at least three different compounds with hydrogen: viz. a solid hydrogen phosphate, P_4H_2; a liquid phosphide, P_2H_4; and a gaseous phosphide, PH_3, called *phosphine*. The last-named compound, analogous to ammonia (NH_3), is usually prepared by heating phosphorus with a strong solution of caustic potash. When thus prepared, however, it contains some vapor of the liquid phosphide, P_2H_4, and as the latter takes fire spontaneously in the air, the impure phosphine, too, is inflammable. But under the influence of light, or by the action of strong hydrochloric or sulphuric acid, and certain other substances, the vapor of the liquid phosphide is decomposed; and if pure phosphine is prepared, say, by passing the impure gas through concentrated hydrochloric acid, it is found not to take fire in the air. The odor of phosphine resembles that of garlic and of rotten fish. The *oxides* of phosphorus include phosphorus trioxide, P_2O_3, and phosphorus pentoxide, P_2O_5. The latter, usually termed 'phosphoric' anhydride, is formed when common phosphorus burns in the air. It forms a white, exceedingly hygroscopic powder, taking up water with great energy to form phosphoric acid. With the *halogens* phosphorus forms a trichloride, PCl_3; a pentachloride, PCl_5; a tribromide, PBr_3; a pentabromide, PBr_5; and a tri-iodide, PI_3. All these compounds are formed by the direct union of the elements. A tri-fluoride, PF_3, and a penta-fluoride, PF_5, are also known.

Phosphorus is a constituent of many tissues, especially the nerve-centres, and its physiological action is that of a tonic. It is chiefly used in medicine in nerve exhaustion, myelitis, neuralgia, osteomalacia, and rickets. It has been used with success in lupus, acne, and psoriasis. It may be given in pill or in solution, the latter being preferable. It may be exhibited dissolved in oil or in chloroform. Phosphide of zinc has been used as a substitute for phosphorus. See ANTIDOTES.

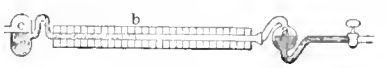
PHOSPHORUS (Lat., from Gk. *Φωσφόρος*, light-bringer). A name of the planet Venus as the morning star, also called Lucifer. As an evening star it is called Hesperus and Vesper.

PHOTIUS, fō'shī-ŭs (Lat., from Gk. *Φώτιος*) (c.820–c.891). Patriarch of Constantinople, one of the greatest theologians and scholars of the Greek Church. He was a member of a patrician family of Constantinople, and during the first period of his life filled various important public offices. In 857 Bardas, minister of the young Emperor, Michael III., undertook to remove the Patriarch Ignatius (see IGNATIUS, SAINT) from his position, and Photius, after being hurried through all the clerical offices in a few days, was put in his place. Pope Nicholas I. (q.v.) espoused the

cause of Ignatius and excommunicated Photius in 863. The latter maintained his position, supported by the Court, and in 867 assembled a council at Constantinople which excommunicated the Pope and his partisans, and withdrew from communion with the See of Rome. (See GREEK CHURCH.) The same year Basil I. succeeded Michael as Emperor, Photius was deposed and Ignatius reinstated. Ten years later, after the death of Ignatius, Photius was restored, and the Pope, John VIII., was induced to acquiesce; but in 881 he also excommunicated the Patriarch, whose relations with Rome continued unfriendly the rest of his life. In 886 the Emperor Leo banished Photius to an Armenian cloister, and he died there about five years later. Photius is revered by the Greek Church, while the Western Church accuses him of craft, violence, and perjury. His theological works include the *Amphilochia*, which not only discusses doctrinal and exegetical questions, but treats also of philosophy, science, medicine, grammar, and history; commentaries on the Gospels and Epistles; and a treatise in favor of the Greek doctrine of the procession of the Holy Spirit. The *Nomocanon* ascribed to Photius is of doubtful authorship. His chief literary and scholarly work is the *Myriobiblion* or *Bibliotheca*, a summary review of nearly 300 works which he had read, most of which are now lost. He also wrote a *Lexicon*, for use in reading the classic authors and the Scriptures. A number of Photius's letters are preserved, as well as sermons of much merit. His works are in Migne, *Patrologia Græca*, ci.-cv. Consult: Hergenröther, *Photius, Patriarch von Constantinopel* (3 vols., Regensburg, 1867-69); id., *Monumenta Græca ad Photium Spectantia* (ib., 1869).

PHOTO-CHEMISTRY. The branch of general chemistry that deals with chemical changes immediately producing or caused by light. In interpreting this definition it must be borne in mind that the combustion of illuminants cannot properly be classed as a form of photo-chemical changes, for the reason that combustion transforms the chemical energy of the illuminant, primarily not into light, but into heat, the latter then giving rise to the production of light. The chemical changes immediately producing light include those undoubtedly taking place at ordinary temperatures in the fireflies and other luminescent organisms, as well as in the eye. All such changes are as yet very imperfectly understood, and photo-chemical research has been confined almost exclusively to the opposite phenomenon, i.e. to chemical changes caused by light.

ACTINOMETRY. That light is capable of causing chemical transformations was not unknown in the eighteenth century. That silver chloride turns dark under the action of light was known to Schultze as far back as 1727. In the latter part of the century it was recognized that sunlight enables plants to decompose carbonic acid gas and set free its oxygen, and about 1840 Liebig grasped the full importance of this process in the economy of nature. But all photo-chemical knowledge remained qualitative until John W. Draper, of New York University, about 1842, introduced the quantitative measurement of the chemical action of light, by constructing the first 'actinometer.' Gay-Lussac and Thénard had observed in 1809 that a mixture of equal volumes of chlorine and hydrogen, which may be preserved indefinitely in the dark, reacts with explosive rapidity if exposed to intense light, and slowly if the light is weak. The product of the reaction is hydrochloric acid gas, which is freely soluble in water, while hydrogen and chlorine are soluble only sparingly. To measure the effect of light in causing the reaction, Draper introduced a mixture of precisely equal volumes of hydrogen and chlorine into a glass bulb (*a*) half



DRAPER'S ACTINOMETER.

filled with water and joined to a glass tube (*b*) likewise filled with the gaseous mixture, provided with a scale, and in its turn joined to a wide vessel (*c*) filled with water. He then exposed the upper part of *a* to light, whereupon part of the hydrogen and chlorine combined into hydrochloric acid, the latter was absorbed by the water, and the consequent diminution of the gaseous volume was shown by the length of the column of water entering from *c* into *b*. Draper's actinometer was improved in 1862 by Bunsen and Roscoe. But even the improved form of the apparatus did not permit of sufficiently rapid experimentation, and consequently the method was soon abandoned. Instead, Bunsen and Roscoe employed an actinometer which measured the chemical intensity of light by the time required to darken a photographic film to a certain standard degree.

In 1879 Eder devised a new method of actinometric measurement. If a mixture of mercuric chloride (corrosive sublimate) and ammonium oxalate in aqueous solution is exposed to the action of light (especially the ultra violet rays), a chemical change takes place resulting in the precipitation of mercurous chloride (calomel), the quantity of which measures the chemical intensity of the light. Account must of course be taken of the fact that the amount of calomel precipitated not only depends on the intensity of the light, but is also influenced by the varying concentration of the solution during the experiment.

In 1897 Rigollot constructed an actinometer by immersing into a solution of common salt two copper plates whose surfaces were previously oxidized in the flame of a Bunsen burner, and exposing one of the plates to the light. If the two copper plates of this apparatus are connected by a wire, an electric current is found to flow from the dark plate toward the illuminated one, the intensity of the current being proportional to the intensity of the light, and hence being capable of serving as a measure of the latter. It may be observed that the principle of electrochemical actinometry was discovered as far back as 1839, by Becquerel, who found that a current passed between two silver plates covered with films of chloride of silver and immersed in dilute sulphuric acid if one of the plates was exposed to the light.

GENERAL PRINCIPLES. Passing now to the few known general principles of photo-chemistry, it must be observed first of all that while it was formerly believed that light of certain colors only ('actinic rays') was capable of chemical action, it is now generally admitted that chemical

changes can be produced by light of any wave-length whatever, including the infra-red and the ultra-violet rays. It is further generally admitted that if a substance is at all incapable of absorbing light, it is also incapable of undergoing photo-chemical changes of any kind. It is often possible, however, to increase the capacity of a substance for absorbing light, by mixing it with other substances which absorb light freely.

When light produces a chemical change, it naturally loses more or less of its original intensity, part of its energy being transformed into chemical energy. When, therefore, light passes through a medium in which it causes some chemical change, its intensity is diminished, first through purely optical absorption, and secondly through 'photochemical extinction.' Thus, for example, if light is passed through a given volume of chlorine gas, it is partly converted into heat and its intensity is found to have diminished by a corresponding amount. If now, in a second experiment, light of the same original intensity is passed through a mixture of chlorine and hydrogen, the intensity is found to have diminished by a greater amount than in the first experiment, owing to the photochemical combination of chlorine and hydrogen into hydrochloric acid. The absorption of light by the hydrogen gas present in the second experiment is small and may be left entirely out of account. In either experiment, the diminution of intensity may of course be measured by means of one of the actinometers described above.

In conclusion, it may be pointed out that if a given substance is capable of undergoing a chemical change both under the influence of light and without this agency, the change in the two cases need not necessarily be quite the same. Thus it has been proved that the decomposition of hydriodic acid takes place, under the influence of light, according to the equation

$$HI = H + I,$$

i.e. molecule after molecule of hydriodic acid is primarily decomposed into single atoms of hydrogen and iodine. On the other hand, if hydriodic acid is decomposed by heat, without the intervention of light, the decomposition takes place according to the equation

$$2HI = H_2 + I_2,$$

i.e. the molecules are decomposed in pairs, each pair yielding a molecule of hydrogen gas and a molecule of iodine.

Consult: Nernst, *Theoretische Chemie* (Stuttgart, 1900); Eder, *Handbuch der Photographie* (Halle, 1884); Niewenglowski, *La photographie et la photochimie* (Paris, 1896); Bunsen and Roscoe, *Photochemische Untersuchungen* (reprinted in Ostwald's *Klassiker der exakten Wissenschaften*, Leipzig, 1892); Draper, *Scientific Memoirs, Being Experimental Contributions to a Knowledge of Radiant Energy* (New York, 1878). See PHOTOGRAPHY; PHOTOSYNTHESIS; PHOSPHORESCENCE; ACTINOGRAPH, etc.

PHOTO-ENGRAVING. The art of preparing, by means of the chemical action of light upon certain bodies, an engraved plate or block for printing. There are two forms of this as there are of manual engraving; namely, engraving in intaglio, in which the ink for printing enters the incised lines and remains there while the rest of the plate is cleaned off; and relief engraving, in which the ink is deposited upon the projecting parts of an engraved block or plate. In either case the paper takes the ink from the surface as in the printing of ordinary manual engravings. Photo-lithography, or the preparation by chemical effects of light of plane surfaces for printing, is treated under LITHOGRAPHY.

INTAGLIO PHOTO-ENGRAVING. This is known by the general name *photogravure*, a French term generally accepted in all languages. Heliogravure is a term which may be taken as the equivalent of photogravure, varying in meaning as does that more general term; but at different times the name heliogravure has been given to special patented or secret processes. Photogravure may have the appearance of pure line work, exactly as in manual line-engraving (q.v.), and it may have the appearance of tint or shade without line, nearly as in the case of mezzotint (q.v.). This form of the art has been carried to such perfection by some workmen, especially in France, that it is to be compared only to the finest and most artistical hand work, having in addition to that artistic charm an accuracy of reproduction which the manual work cannot pretend to. Thus in the large books on painting and monographs of special painters issued during the last twenty years, and especially the more recent ones, such as De Beruete's *Velasquez*, Yriarte's *Mantegna*, Lady Dilke's *French Painters of the Eighteenth Century*, Armstrong's *Gainsborough*, *Turner*, and other volumes, and the splendid catalogues of public and private collections, photogravures alternate with half-tone prints and other prints from photo-engraving plates, but the photogravures are distinguishable at once by the fineness of their texture (pure line in the one case and grain or texture in the other), in which no other process can approach them. In the case of line photogravure the facsimile of a drawing or of a print from an engraved plate may be so perfect to be indistinguishable from the original except by the most minute examination of an expert. Thus in the published work of Amand-Durand of Paris, the facsimiles of fine prints from the plates of Dürer, Rembrandt, Claude, Paul Potter, and other celebrated etchers and line engravers caused astonishment and doubt among collectors of prints when those facsimiles first appeared about 1870. Here was an unquestioned original Rembrandt, not a copy, as any student of Rembrandt would know, and yet it was printed upon modern paper. In all these processes, however, hand work has to be called in to complete the plate; and it is a general truth that the most artistic workmen produce the most perfect photogravures. In the case of Amand-Durand there was the peculiar advantage that the director himself was a skilled engraver before he undertook the photo-engraved process.

Gelatin treated with bichromate of potash is made insoluble under the action of light. Instead of gelatin some other form of albumen may be used, or asphaltum, which is found to answer equally well and to be cheaper. In making a photogravure in line a photographic transparency, or positive, of the drawing or print or picture or object which is to be reproduced is placed in contact with a copper plate coated with asphaltum or albumen mixed with a bichromate, and strong light is allowed to pass through the negative to the sensitized surface. Only those parts where the light passes through the negative with-

out interruption will be marked by complete insolubility of the gelatin; elsewhere the surface remains soft and capable of being dissolved away by washing. In this way the surface of the prepared plate affected by light is turned into a relief copy of the original. The plate is then etched by an acid, perchloride of iron, which eats it away exactly as in the case of ordinary etching (see ETCHING). When it is a line plate which is being prepared no other important steps are necessary; but when the plate is to be a tint plate or gradation plate without line and producing prints much like those taken from a mezzotint, it is usual to prepare the surface of the copper plate in the first place, by precipitating upon it a fine powder of resin or of resin and asphaltum in combination. This powdered surface prevents the complete access of the mordant to the metal exactly as in the case of aquatint (q.v.). The granular surface so obtained may be either coarse or indefinitely minute, this depending upon the character of the subject to be reproduced. In this way the reproductions of portraits by the greatest master of refined execution or landscapes of minute detail of most varied character may be reproduced with a perfectness of gradation equal to that of hand work in its highest perfection.

As it has become customary to illustrate costly books by means of large photogravure plates, so it has become usual to employ living artists of celebrity to make original monochrome pictures for such reproduction. These are sometimes produced in the more usual fashion by means of water-color work in bistre, sepia, India ink, or other one-colored pigment, but they are also made on a very large scale by oil painting upon canvas, exactly as in the case of paintings intended for exhibition or sale, except that they are worked in such gray or brownish-gray pigment as the painter and the photographer agree upon as convenient for the one and most easily adapted to the work of the other. Such monochrome paintings are often of considerable importance, and those collectors of works of art who have purchased them at the time of their production have considered them an important part of their possessions. It may be stated, also, that the improvements made in orthochromatic photography have made it possible to obtain very accurately the relative color values of the most difficult subjects, elaborate oil paintings, and the like.

The difficulty with the employment of photogravure in book work is the great cost, not alone in the production of the plates (for it is not uncommon to take two or three months in the perfection of a large plate), but of the printing, which has to be done on a hand press, and slowly, so that every separate impression, of which fifty may be bound up in a folio volume, will have cost a definite sum of money over and above the cost of the plates. It is on this account that modified processes are continually brought forward intended to produce plates from which the printing may be done more rapidly. There is, however, always the difficulty in printing from intaglio-engraving, that in order that the paper shall take the ink from the incised lines perfectly, leaving none behind, so that the design is reproduced in every minute particular by the raised pattern of ink on the paper, only a slow and painstaking process will serve.

A kind of photogravure has been introduced in which a screen is employed to make the grain exactly as in the case of the half-tone process described below. This, of course, if perfected, will tend toward much greater ease in rapid printing.

RELIEF PHOTO-ENGRAVING. This covers all those processes by means of which a surface is prepared like that of a wood engraving, the lines, points, and small surfaces which are to be reproduced upon the paper standing up in low relief from the background which is cut away. The level surfaces of these lines and points must be exactly true and uniform, all in one plane, except where it is deliberately lowered in one place or another in order that the block at that point shall press the paper less firmly and the ink impression show pale in contrast with other and blacker parts.

One of the most difficult of these processes is that called commonly the Gelatin Process, or, to distinguish it from others also depending upon gelatin, the 'swelled gelatin process.' It is an expensive process and one requiring the greatest care to employ it successfully, but its results are not very markedly inferior to that of photogravure which is not in distinct line. In fact, a good print made by this process may be often taken for a photogravure print of somewhat inferior excellence, without clear black and white, with a too uniform texture and a cloudy rendering of details. A sheet of glass is coated with a film of gelatin sensitized with bichromate of potash and exposed under a black and white negative. The film is then soaked in water and swells up where the opaque lines corresponding to the whites of the design protected the film, while the surface of the film corresponding to the black lines of the design do not swell. From the surface so produced a matrix is made, and from this another in a material such as wax, and, again, an electrotype of copper is made and mounted upon a block to give it the requisite stiffness and thickness.

The Woodbury type, the collotype, the artotype, the heliotype, the albertype, and many similar processes are all based upon the properties of certain resinous and glutinous substances, and their changes when submitted to light. Asphaltum, albumen, and gelatin are the three used.

The Half-Tone Process has resulted from the invention of the mechanical art of ruling lines of extreme fineness, of perfect uniformity in width, and at absolutely equal distances from one another. This, which was not practicable until within comparatively recent years, has now been developed so that plates of glass can be ruled in this way with minutely incised lines, two hundred or even three hundred to an inch. When two glass plates, each ruled with lines of this sort, for instance, diagonally across the plate, are brought together in such a way that the two sets of lines cross one another, the result is, as seen by transmitted light, a fine network of square or diamond-shaped mesh. The half-tone process depends upon this 'screen,' as it is called. The photographic negative is made by light passing through this screen, placed at a suitable distance in front of the sensitive plate, and the result is an image broken up into minute dots, easily seen with a magnifying glass. There is no absolutely continuous gradation of tint; but everywhere a

series of very small dots which constantly increase and decrease in darkness or intensity, conditioned upon the relative lights and darks of the subjects to be reproduced, and which are small enough to produce a general effect of uniform gradation. This negative reversed is placed in contact with a carefully prepared copper plate, the zinc is also used that has been coated with a preparation of fish-glue, bichromate of ammonia, albumen, and water. It is then exposed to the light and afterward washed in water, and those parts protected from the light by the dense portions of the negative will be washed out of the half-tones in due proportion. After burning in—that is, heating over a gas stove—the plate is all ready for etching, which is done in the case of a copper plate with perchloride of iron, or with zinc nitric acid.

The half-tone process requires less artistic sense and ability than, for instance, photogravure, but it requires the neatest handling, the most perfect delicacy of treatment, and it is often necessary for a good block that the acid should be applied in several consecutive 'rebitings' before the surface is perfect. In much of the finest work of to-day the highest lights and delicate tone gradations are very skillfully retouched by an experienced wood-engraver. Much of the re-engraving by hand, however, is clumsily done, and adds to the shortcomings of poor plates.

The special utility of the half-tone block is in this, that it can be printed with type. In order that this may be done, the metal plate is backed up by a block of wood of the right thickness, so that the surfaces of the prepared metal shall be exactly even with the front of the types. With reasonably careful work in the preparation of the stereotype plates and the like, a page may be printed of typography with pictures of full light and shade incrusted in it; the whole printed together, and that even on the power press.

The Line-Cut Process gives an exact facsimile of a drawing in solid or dotted black lines. Any drawing which an artist will make with a point, as of a pen, or a brush, and which does not include tints or half-tones, can be reproduced in exact facsimile. The process is similar to those described above. The light passing through the negative hardens the prepared surface, and the unsoftened stuff is washed away. In fact, this may be considered the original process from which the half tone process has been produced by natural evolution, that is by the development along obvious lines. The linecut block can be used in connection with type exactly as half-tones at a very much less cost and with greater facility and less care in the manipulation.

Colored Printing from Photo-Engraved Surfaces. The most important process of this kind is that known as the Three-color Process. This has become a very familiar and widely used process and promises well. The system is based upon the scientific fact that all the colors of the spectrum may be obtained from the three primaries, red, blue, and green. The rays of light are separated by means of what are called photographic filters, which are partly transparent substances which allow particular rays to pass while they stop or restrain others. Thus one of the three filters will allow only blue rays to pass. By this appliance used in connection with the half-tone process there may be produced a perfect blue picture, and again with the use of other filters a green and a red, or approximately red picture. The printing of all these, one upon another, approximates very closely the complete chromatic result desired, that is to say, a picture in full color. The chief difficulties of the process are in the making of correct negatives, accurate registration in printing, and appropriately colored inks. The result so far may be said to approximate to the reproduction of fine manual painting. One obvious reason for this imperfection of the result is found in the inferior effect of colors superimposed to those which are laid side by side. Every student of painting knows how much more brilliant a gradation can be procured by putting touches of color close together, side by side, than by laying those colors over one another. It is true that much work, especially in oil painting, is done by superimposed color, but this is when the upper coat of pigment is more or less translucent, as when the yellow below shows through the thin glaze of blue to produce a certain quality of green. Commonly the juxtaposition of color is more brilliant than the superimposition of color; and this fact causes an indefinitely great amount of thought and experiment among those who are trying to improve the three-color process.

Another and more complex process of photographic color work has been introduced in the United States within the last four years, and some of the results are surprisingly accurate reproductions of the originals. The greatest successes in the color work have been obtained in the reproduction of colored textiles, notably in imitating the richness of color and texture of Oriental rugs. This is a secret process, and the methods employed are very carefully guarded. It is something more than the ordinary three-color work, and apparently as many as seven colors are employed in some cases. It is as yet costly.

PHOTOEPINASTY (from Gk. *φῶς, phōs*, light + *ἐπί, epi*, upon + *ναστός, nastos*, solid, from *νάσσειν, nassein*, to press close). The action of light in accelerating the growth of the upper sides of dorsiventral organs, such as leaves. *See* Growth.

PHOTOGRAPHIC SURVEYING (from Gk. *φῶς, phōs*, light + *γράφειν, graphein*, to write). In recent times the art of photography has found its way into surveying, an application due chiefly to the French. Its advantage was at once recognized for military and topographical purposes, but its usefulness for accurate and extensive surveys is still quite limited, owing to the imperfections of the photographic lens. The chief instrument is a view camera provided with cross-wires and an apparatus for leveling. A survey is effected by selecting at least two stations, and measuring the base-lines between them. Then at each station a series of plates are exposed, the camera being turned at each successive exposure sufficiently to obtain for the series a continuous photograph of the area to be surveyed. The method of executing a map and of calculating heights and distances from photographs is best obtained from works on the subject, but a general idea may be gained from the following. Since the images of the cross-wires are photographed on the plate, every point of the field

appears in its proper position in relation to the four quadrants of the plate. Thus in Fig. 1 IIII'

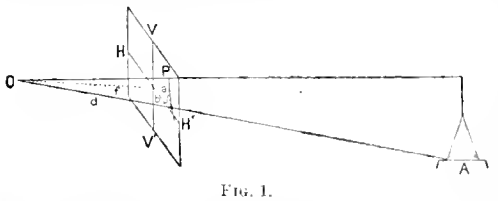


FIG. 1.

is the image of the horizontal wire, VV' the image of the vertical wire, and P the image of a church spire. The lines *a* and *b* can be measured in the photograph, and the focal distance *f* being known, line *d* can be computed, and when the distance OA has been determined from the map, the height of the spire above the level of the instrument is given by similar triangles. To plot a survey, the angular distance of any point from the base-line is determined by a photograph taken at each end of the base. In Fig. 2, P represents the plate of the camera at station A; B', C' being the images

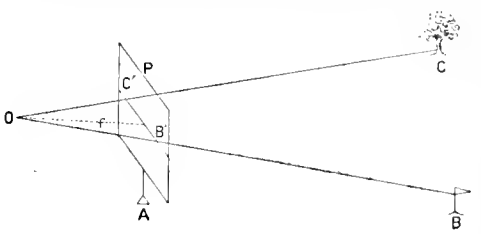


FIG 2.

of station B and the point C: the angle B' OC' can be determined from B' C' and the focal length *f*. Then any point of the map may be plotted as follows: Lay off the base-line to a desired scale, and draw lines making angles with the base equal to those computed. These will intersect in a point on the map corresponding to the point in the field. Consult Deville, *Photographic Surveying* (Ottawa, 1895). See SURVEYING.

PHOTOGRAPHY. The art of producing the appearance of objects and fixing them by means of light on a previously sensitized surface, and the reproduction of the image thus obtained, by various processes, on glass, paper, and other materials. The first photographic camera was in reality a darkened room to which light was admitted through a single small hole in the window shutter. This was the camera obscura of Giambattista della Porta, an Italian philosopher, invented by him in the last half of the sixteenth century. When the sun shone brightly, a faint inverted image of a landscape could be seen on the whitened surface of the wall within. The camera obscura of the present time differs very little from Porta's invention except that it contains a lens in the apex of the roof, with a reflecting mirror above it, in order to throw the light from all the surrounding landscape down through the lens and thus form a panorama on the surface of a table placed in the middle of the room. J. H. Schultze, a German, who has been called 'The Columbus of Photography,' obtained the first actual photographic copies of writing as early as 1727, by placing the written characters upon a level surface previously prepared with a mixture of chalk and silver nitrate. The rays of light passing through the translucent paper blackened the silver compound underneath, except where it was protected by the opaque ink forming the letters themselves, and thus a white copy upon a black ground was obtained.

Scheele in 1777 demonstrated that silver chloride became black quickest by the action of the violet rays of the solar spectrum, thus showing that the rays of light were not equally active. A few years later Professor Charles projected the shadow of a head by means of strong sunlight on a sheet of white paper which had been made sensitive by chloride of silver and obtained a white profile on a darkened surface; but he was unable to fix the image upon the sensitive paper. Meanwhile the members of the Lunar Society, including Samuel Parr, James Watt, Josiah Wedgwood, and others, met regularly at the house of Matthew Boulton at Soho and discussed their experiments, some of which were on the action of light, and it has been shown that an artist named Eginton, in the employ of Boulton, made and sold numerous copies of well-known paintings at very low prices. Thomas Wedgwood, to whom is due the honor of being the first to produce pictures by the action of light on a sensitive surface, published his paper giving "an account of the method of copying paintings upon glass, and of making profiles by the agency of light upon nitrate of silver, with observations by H. Davy," in the *Journal of the Royal Institute* for June, 1802. To Davy credit is due for his discovery that silver chloride was more sensitive than the nitrate; but, notwithstanding his continued investigations, Davy was unable to find a means by which the fading out of the pictures could be prevented. Other investigators took up the subject later, among whom may be mentioned Joseph Niepce and Daguerre in France, and William H. F. Talbot in England. The first-named, in 1814, succeeded in producing permanent pictures by a process which he called *heliography*. It consisted in coating with bitumen a piece of plated silver or glass, which was then exposed in a camera obscura during 4 to 6 hours. Those portions of the bitumen which were acted on by the light became insoluble, and by removing the parts unacted upon by certain essential oils in which bitumen was soluble, the shadows of the image were removed, and the lights were represented by the insoluble bitumen that remained on the plate. This process was therefore the forerunner of our modern photo-mechanical methods. In 1824 Daguerre began his experiments, which led to the invention of his celebrated process. He formed a partnership with Niepce in 1829, and ten years later they announced the invention of the daguerreotype process, the principle of which had been discovered by Daguerre in 1832. The process consisted in exposing a metal plate covered with silver iodide for twenty minutes in a photographic camera, after which the plate was transferred to a dark room and exposed to the vapor of mercury, which developed the latent image, the latter being then made permanent by means of a solution of sodium chloride. Sir John Herschel, who devoted considerable attention to this subject, soon after announced the greater suitability of sodium hyposulphite for dissolving the haloid salts of silver and consequently the hyposulphite was adopted as a

fixing agent. Daguerre received a pension of 6000 francs from the French Government on August 10, 1839, in consideration of which the details of his process were given to the world. Information of this invention reached the United States in 1839 through Samuel F. B. Morse, who communicated it to his colleague in New York University, John W. Draper (q.v.), by whom the first sunlight picture of a human face (that of his sister Dorothy Draper) was made in 1840. Meanwhile Talbot, in England, had been pursuing investigations from a different view-point, and on January 31, 1839, he presented before the Royal Society a paper on "Pathogenic Drawings." These he produced by dipping writing paper in a solution of sodium chloride, drying, and then transforming the sodium chloride into silver chloride by passing the paper through a solution of silver nitrate. With this paper, which was extremely sensitive to light, he was able to produce a negative that became black by the action of sunlight except where it was covered by some opaque object, which he desired to reproduce, and in turn from this negative, by another exposure, a number of positive prints could be obtained, which were fixed by potassium bromide. Two years later Talbot patented his 'calotype' process, in which the negative was obtained by coating the surface of the paper with silver iodide, then washing it over with a mixture of silver nitrate with gallic and acetic acids, after which it was exposed in a camera to the object he wished to copy. The invisible picture thus obtained was developed by silver aceto-nitrate and gallic acid, and fixed with potassium bromide. Minor inventions and improvements followed the introduction of Talbot's process, among which the most important was the use of albumen, recommended by Niepce de St. Victor as a film containing haloid salts which he flowed upon the surface of the glass.

The development of the modern rapid processes of photography may be said to have begun with the introduction of the dry collodion process by Scott Archer in 1851. This process consists in coating glass plates with a film of collodion containing soluble iodides or bromides, which form a sensitive silver compound when dipped in a solution of silver nitrate. The soluble collodion is prepared by the action upon cotton of a mixture of nitric and sulphuric acids with a little water, or of a mixture of potassium nitrate with sulphuric acid, the resulting substance being dissolved in a mixture of alcohol and ether. On evaporation, the viscous solution leaves a film of collodion. The exact proportions of the ingredients used must be varied at different seasons of the year, and must be suited to the character of the objects to be photographed, one variety being suitable for landscape views, another for portraiture, etc. The collodion is flowed over the glass plate, which must be perfectly clean, and when partially dry sensitized by dipping into a bath containing silver nitrate in the proportion of from 35 to 50 grains of the salt to an ounce of water. A very small quantity of potassium iodide is added to the bath. The sensitized plate is then exposed in the camera to the object to be taken. The action of the light on the sensitive silver salts changes them in such a way as to produce a latent image on the film, which is then developed by pouring over the plate a solution of ferrous sulphate or pyrogallic acid, to either of which are added some alcohol and acetic acid, after which the image on the plate is made permanent or fixed by immersion in a solution of sodium hyposulphite, potassium cyanide, or some other liquid capable of dissolving the portion of the silver salts that has not been acted upon by the light. For the protection of the collodion film it is common to coat the negative with a clear and hard varnish.

As the wet process required that the plates be prepared at the time of exposure, that process naturally found its most extensive employment for indoor work, and continual efforts were made to devise portable plates. Finally plates were introduced which were sensitized, washed, dipped in some organic preservative, such as a solution of tannin, and then dried.

In 1871 Maddox introduced the earliest form of the 'gelatin-emulsion process,' which has since been considerably improved, and is now used very largely. In this process the sensitive silver salt is held in suspension in either collodion or gelatin. The collodion emulsion may be made by dissolving in one portion of collodion a solution of zinc bromide, in another a solution of silver nitrate, and then thoroughly mixing the two portions. The gelatin emulsion may be prepared by bringing into solution the gelatin with potassium bromide, while a solution of silver nitrate to which some ammonia is added is gradually poured into the liquefied solution of gelatin. These emulsions are floated on plates and dried. Modern plates of this nature are found to be from ten to a hundred times more sensitive than the older wet plates, and have thus made possible the photography of moving objects and of those which are only dimly lighted. They also make possible the flash-light pictures by means of which instantaneous views are taken of a dark interior during the burning of a small quantity of magnesium. A large variety of developing agents are employed with the modern dry plate. Pyrogallic acid in connection with an alkali is perhaps the most common. Sodium hyposulphite is almost entirely used as the 'fixing' agent.

The camera consists of a box, either of wood or a framework of wood with a bellows-expanding body of leather, so that when closed the camera may occupy but little space and be conveniently carried. In the front of the camera is the lens, and at the back a piece of ground glass on which the image of the object to be photographed may be focused, together with an arrangement for lengthening or shortening the body of the camera. The camera should be placed so as to insure perfect rigidity when fixed, and for indoor work should be strong and steady, while for outdoor photography the camera stand should be made light so as to be easily portable, or the stand or tripod may be dispensed with altogether.

The lens is of very ancient origin. There is a lens in the British Museum which was found in the ruins of Nineveh, and during the Middle Ages the manufacture and properties of simple lenses were well understood in Europe. In general use now, four varieties of lenses are common: (1) A single lens consisting usually of a combination of two converging meniscus lenses separated by a diverging meniscus, arranged as a combination in the tube of the lens at the end nearest the camera, the convex side of the combination being toward the plate; (2) a rapid rectilinear lens consisting of a converging meniscus lens cemented to a diverging meniscus, the latter occupying the

outside position in the tube; (3) a wide-angle rectilinear lens of somewhat similar construction, having two combinations formed of meniscus lenses, but of much deeper curvature than those employed in other combinations, and placed closer together in the lens tube; and (4) the portrait lens, consisting of a back and front combination, arranged at some little distance apart, the front combination containing a double convex and a plano-convex lens cemented together, the double convex lens taking the position next the object, while the back combination consists of a double convex and a diverging meniscus lens, which are frequently mounted so as to leave a small space between the two.

In photographing an object the camera is set up, and, after the image is properly focused on the ground glass plate, the holder containing the sensitized plates, which are carried in double-backed dark frames arranged to carry two plates, each back to back, is inserted in the camera and the cover of the slide is withdrawn, exposing the sensitized plate so that it receives the picture. The shutter is then closed and the cover of the dark slide placed over the plate, which is later taken to the dark room for development.

For the bringing out or 'developing,' as it is called, of the latent image that has been produced on the sensitive plate, it is treated with various solutions; thus, in the daguerreotype the vapor of mercury is the agent used, and in the wet collodion process, as has already been mentioned, the development is effected by ferrous sulphate or pyrogallic acid. In the case of the dry plates, a developer, prepared by adding one part of a saturated solution of ferrous sulphate to four parts of a saturated solution of potassium oxalate, to which has been added a very small quantity of a solution of potassium bromide, is sometimes employed. A ferrous citro-oxalate is frequently used instead. As the plates are exceedingly sensitive, they must be developed in a dull ruby light, and the operation is accomplished by laying the plate in the developing tray, face upward, after which the liquid is run gently from one end of the plate to the other. Excellent results have also been obtained by the use of hydroquinone, eikonogen, metol, etc. These substances, when mixed with potassium bromide and sodium sulphite to act as reducing agents, produce very clear negatives. But pyrogallic acid is still most largely used as a developing agent.

For the reproduction of printed copies from the negative, a paper sensitized by dipping in a solution of silver nitrate is employed, and is then exposed to the sunlight, under the negative. The paper, which should be of some light and moderately strong quality, is first coated on the surface with a smooth layer of albumen to which either ammonium or sodium chloride has been added, and then floated in a solution of silver nitrate of varying strength, according to the condition of the negative, and of which 50 grains of the salt for every ounce of water is an average proportion. The exposure to light also varies according to the brightness of the light and the character of the negative. The print thus obtained is toned by immersion in a neutral solution of gold containing certain metallic salts, and finally the image is fixed by immersing the print in a solution of sodium hyposulphite which removes the unaffected silver salt. The final operation consists in thoroughly washing the print, after which it is ready for mounting.

The gradual disappearance or fading out of prints made with silver salts led to numerous attempts to find satisfactory substitutes, and various metallic salts have been employed for the purpose of producing permanent prints, some of which are described in the following paragraphs:

Cyanotype or Blue Prints. The earliest of these is perhaps the one first described by Sir John Herschel, and consisting in the reduction of ferric salts by light. Solutions of 1 part each of ammonium ferric citrate and potassium ferricyanide in 8 parts of water are made separately and then mixed in a dark room. The paper or cloth is floated on this solution and exposed under a negative to the action of sunlight, and then thoroughly washed. This process is employed largely for copying plans by builders and architects, and the lines of the drawing appear white on a blue ground. It is much used on account of its cheapness and simplicity. A somewhat similar process, in which the ammonium ferric citrate is substituted by a solution of 1 part of uranium sulphate in 4 parts of water, yields a beautiful rich brown print.

Ferrotype, or Tintype. In this process a piece of sheet iron is japanned with black varnish and baked, after which it is sensitized with a collodion solution and exposed in a camera to the object, then developed and finally covered with some protective coating. See Ferrotype.

Platinotype. The substitution of platinum for silver, originally introduced by W. Willis, has found considerable favor, owing to the fact that the prints are both richer and more permanent than those made with silver salts. The original process consisted in sensitizing the paper with a mixture of ferric oxalate and a platinum salt. Exposure to light resulted in the reduction of the ferric salt to the ferrous state, and when the ferrous salt was in solution the platinous salt was reduced by it. By floating the exposed paper on a solution of neutral potassium oxalate, which is a solvent for ferrous oxalate, the platinum salt in contact was immediately reduced to the metallic state and the image built up. Such prints were fixed by immersion in dilute hydrochloric acid, which dissolved any ferric oxalate or calcium oxalate that might be present. A second process has been introduced in which the paper is simply coated with ferric oxalate containing a small quantity of mercuric chloride, which after exposure is developed by a solution of potassium oxalate with the platinum salt. A still more recent method is one in which the paper is sensitized with a mixture of the platinum salt with sodium-ferric oxalate and sodium oxalate, and under the influence of light and the moisture of the air the reduction of the platinum salt takes place in the printing frame. Excellent results have been obtained by toning silver prints with platinum, which yields rich brown and black tones.

Photo Mechanical Processes. Methods by which photographic impressions could be reproduced by mechanical means, and so used directly on the printing press, have naturally been sought for, and have been invented. Such processes depend for the most part upon the action of light on a gelatin film impregnated with a bichromate, generally of potassium or ammonium. The processes in question may be divided into two groups.

In processes of the first group, the picture is molded in gelatin and colored by a pigment. The group includes the Woodburytype or Photoglyph and the Stannotype. In the Woodburytype a sheet of bichromatized gelatin, a highly sensitized mixture of gelatin and potassium bichromate, is prepared and a thin film exposed under a negative to a strong light and then washed to remove the unchanged gelatin that was protected from the light by the negative, and finally dried. This film is placed upon a sheet of soft metal, usually lead, and forced into it by hydraulic pressure, producing a mold of the picture, in which the dark parts are in intaglio and the light ones in relief. This mold is then inked with a solution of warm gelatin colored with pigment, and a sheet of paper laid upon it, a strong pressure exerted in a horizontal press, the excess of ink being forced out by pressure. The print is then immersed in a solution of alum, which renders the picture insoluble. The Stannotype, which is a modification of the foregoing process, consists in substituting for the lead plate a thin sheet of tin-foil properly strengthened in the back by electrotyping material. In the photo-mechanical processes of the second group, the picture is printed with ordinary printing ink from a gelatin surface, from stone, from metallic relief surface, or from an intaglio copper plate. The 'collotype' or 'phototype' processes of this group, in which the picture is printed from a gelatin surface, are represented by the *Albertype*, invented by Joseph Albert, of Munich, in 1869. This process consists of coating a sheet of plate glass with a thin film of chromatized albumen and gelatin, which is then laid face down on black cloth and exposed to light. The insoluble gelatin next to the plate adheres firmly to the glass and serves as a foundation for a second film, which consists of chromatized gelatin. The dry film is placed under the negative in a printing frame and exposed to the light until the shades of the image are visible through the glass. Next the plate is washed in water to remove the soluble bichromate, and the film hardened with chrome alum and dried. The plate is fastened to the bed of a printing press by means of plaster of paris. The *Artotype*, which is similar to the foregoing, was invented in 1878. A mixture of albumen and soluble glass is used for the foundation on which the sensitive film is afterwards placed. As such a film does not require to be hardened by light opaque metallic plates may be used instead of a glass plate, as in the previous process. *Indotints* or *autoglyphs* are produced by processes similar to the foregoing, except that the support for the gelatin film is usually of copper slightly roughened in order to cause the sensitive film to adhere firmly. The addition of alcohol to the chromatized gelatin is said to increase the toughness and tenacity of the film. After exposure under the negative the unchanged bichromate is washed out and the plate is dried. Prints from such plates can then be taken on a power press. The heliotype process differs from the foregoing by the hardening of the gelatin film with chrome alum and the detaching of it from the support upon which it was first prepared; thus yielding, when completed, a thin sheet or skin of gelatin that is both tough and flexible, and which may be placed on a plate of zinc or attached to a cylinder when used for printing.

Excellent results in color have been obtained in the foregoing processes by preparing several gelatin plates, each of which corresponds to a different color in the original, and these are then used for printing with colored inks. Prints have been produced in which as many as seven successive distinct colors have been used. In those processes in which the picture is printed from stone, a sensitive mixture of albumen and ammonium bichromate in water is passed over a lithographic stone which has been thoroughly polished and cleaned. The excess is carefully rubbed off and the surface of the stone dried so as to remove all traces of moisture. It is then exposed under a negative, and wherever the light penetrates to the chromatized albumen it becomes insoluble. After sufficient exposure the surface of the stone is covered with lithographic ink and washed with water so as to remove the soluble parts of the film, and then treated with the acid and gummed and printed as in ordinary lithography. The difficulty in handling the heavy stones soon led to the invention of an improved process, in which a sheet of paper, sensitized with a solution of albumen, gelatin, and potassium bichromate, was placed face down on a sheet of smooth copper, and then exposed under a negative, after which it was coated uniformly with the usual lithographic transfer ink. The paper was then floated on boiling water in order to coagulate the albumen on the film, and the unaltered gelatin which was protected by the opaque portions of the negative absorbs moisture and swells, leaving the unaltered gelatin depressed. This print, again washed and then dried, is transferred to stone by simply placing it upon that material face downward and passing it through the press.

Processes in which the picture is printed from a metallic relief surface include the ordinary photo-engravings or photo-electrotypes. In the former a plaster mold is taken of the gelatin film and a cast reproduced in type metal, when it is called a *photo-engraving*, or in copper, when it is known as a *photo-electrotype*. These include those processes of photo-etching in which the pictures are printed from zinc plates to which the design has been transferred in adhesive transfer ink from paper, similar to the transfer process referred to under LITHOGRAPHY, section on *Photolithography*. The zinc plate thus obtained is then treated with acid in order to lower the white portions, producing a low relief.

Processes in which the picture is printed from an intaglio copper plate had their origin in France, and were known variously as *photogravures*, *photo-aquatints*, etc. These consist of gelatin relief films similar to those of the Woodburytype (see above), with certain modifications which caused the production of a grain in the relief film; thus in the case of the photogravures of Goupil, the material producing this effect is said to be pulverized glass. A mold is then made from the gelatin relief, from which a copper plate is obtained by electrotyping, from which the prints are then carefully made.

The invention of a transparent and flexible film pelliele for supporting the sensitized photographic surface was made by Hannibal Goodwin, and his application for patent was filed May 2, 1887, but the patent was not issued until September 13, 1898. The substance itself was entirely new, and the manufactured article consisted of a film support of a dried and hardened celluloidal solution of nitrocellulose. The film must be

non-greasy, insoluble in developing fluids, insensible to heat and moisture, hard, smooth, brilliant of surface, exceedingly thin and light, and absolutely transparent. It was no easy matter to obtain all these properties in the new support, and it is only after many years that the film has succeeded in supplanting, to any great extent, glass as a supporting substance. It was a very important invention and has made possible the widespread modern employment of photography by amateurs. The roll holder, by means of which a long strip of film can be carried in a comparatively small space, was first suggested by W. J. Stillman, and has led to the modern hand camera for films, and later to the so-called system of 'daylight photography,' which still further increased and simplified the use of photography by amateurs.

Applications of Photography. In addition to the production of pictures of persons and scenery, photography finds extensive application in reproducing paintings and thus popularizing famous works of art. Photography is further employed in many branches of science. The micro-photographs of minute forms of life have added much to our knowledge of such organisms, and the photographs of the heavens are furnishing innumerable data that will doubtless lead to astronomical generalizations of the greatest importance. (See Astro-Photography.) The application of photography in legal matters for the purpose of showing forged signatures and establishing facts that were disputed has been of the utmost value. Photographs taken from balloons during the Boer War furnished information that proved of great value. The biographic pictures in which the effect of motion is reproduced in consequence of the successive exposure, occupying but a 250th part of a second, has brought about a revision of the opinion in regard to many forms of motion, the details of which can now be studied. And the employment of photography is constantly growing.

Photography in Law. The courts have generally recognized that an accurate likeness of an object or place can be reproduced by means of the art of photography, and photographs are now often an efficient means of demonstrating a fact in the trial of a cause. They are admitted in both civil and criminal cases as an aid to the jurors in their efforts to understand descriptions of places and objects which might not otherwise be presented in an intelligible manner.

By the general weight of authority a photographer has no right to print copies from a negative likeness of a person, for his own use or distribution in any way, without the person's consent. The person whose likeness is thus taken may restrain the sale of his photographs, and recover such damages as he may have sustained by reason of the sale of the copies. This is generally placed on the ground of implied contract, and sometimes of breach of confidence. The photographer owns the negative, but the person whose likeness is on it has the right to say whether it shall be used or not.

Bibliography. The literature of photography is so extensive that mention can be made of but few of the many works dealing with the subject in its different aspects. In fact, many of the authorities have prepared a number of works each of which discusses a single process or phase of the subject, and these should be consulted by the reader in search of information. The works of Abney, Robinson, Vogel, Eder, and Burton are all authoritative and valuable. The following works will doubtless be of service to the reader, although it must be understood that such a list is by no means comprehensive:

Harrison, *History of Photography* (New York, 1887); Abney, *Instruction in Photography* (London, 10th ed., 1900); id., *Photography with Emulsions* (New York, 1886); id. (with H. P. Robinson), *The Art and Practice of Silver Printing* (London, 1888); Vogel, *Chemistry of Light and Photography* (London, 1882); Dallmeyer, *Telephotography* (London, 1899); Burton, *Photographic Optics* (New York, 1891); id., *Modern Photography* (London, 1892); Lummer, *Contributions to Photographic Optics*, translated and augmented by S. P. Thompson (London, 1900); Duchochois, *Photographic Reproduction Processes* (New York, 1891); Wilkinson, *Photo-Engraving in Line and Half-Tone* (London, 1886); id., *Photogravure* (London, 1890); Bolgas, Talant, and Senior, *A Handbook of Photography in Colors* (New York, 1900); Woodbury, *The Encyclopædia of Photography* (London, 1892); Wilson, *Cyclopædic Photography* (New York, 1894).

Among the more prominent English and American annuals may be mentioned: *The American Annual of Photography* and the *Photographic Times-Bulletin Almanac* (New York), and *The British Journal of Photography Almanac* (London). The principal current periodicals are the *Photographic Times-Bulletin* (New York), *Wilson's Photographic Magazine* (New York), *The Photo-Miniature* (New York), *Camera Work* (New York), *Camera Notes* (New York), *The Photo-Beacon* (Chicago), *Camera Craft* (San Francisco), *The Professional and Amateur Photographer* (Buffalo), *The Photo-Era* (Boston), *The British Journal of Photography* (London), *The Amateur Photographer* (London), *Photography* (London), *The Photographic Art Journal* (London).

PHOTOLITHOG'RAPHY. See Lithography, section on *Photolithography*.

PHOTOM'ETRY (from Gk. φῶς, *phōs*, light, + -μετρία, *-metria*, measurement, from μέτρον, *metron*, measure). The science of comparing the intensities of sources of light. It is impossible at the present time to measure the intensity of a source of light in terms of any absolute standard, i.e. in terms of watts; and therefore it is customary to compare the intensity with that of a standard source of light, and for this purpose various standards of white light have been proposed and used, but none have been completely satisfactory. These will be found discussed below. The 'intensity' of any source of light is defined to be the amount of light emitted through a cone whose solid angle is unity. The 'flux of light' is the amount of light emitted through any sized solid angle. The 'illumination' of any illuminated surface is the flux of light falling upon it divided by its area. The 'brightness' of a source of light, if it is a surface, is the intensity divided by the area of the surface. See an article by Crew, *Astrophysical Journal*, vol. vii., p. 298, 1898.

If a surface is illuminated by a small source of light, its illumination varies directly as the intensity of the source and inversely as the square of its distance from the surface. (See Light.)

intensity of two sources may be compared, by first allowing two portions of the same surface to be illuminated by them. If the illumination over these two portions is the same apparently to the eye, the intensities of the two sources are in the same ratio as the squares of their distances from the surface. There have been several devices invented to secure the illumination of two portions of the same surface by the two sources. These instruments are known as photometers and are described below. The problem of comparing two colored sources of light, or of comparing the intensities of the colors produced by two sources of white light when dispersed by a prism, is practically the same as that just discussed, but requires a photometer adapted for this purpose. See SPECTROPHOTOMETRY.

PHOTOMETERS. Most photometers are based upon the law of the inverse squares and enable us to compare the relative intensities of two lights by finding at what distance they furnish equal illumination. There are also other photometers, but those depending on the equality

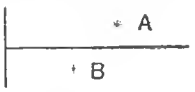


FIG. 1.

of illumination are by far the most extensively employed. The earliest photometer was devised by Bouguer and consisted of a vertical screen at right angles to a partition. On either side of the partition was placed a light so that it would illuminate one side of the screen. These lights were then adjusted until the two halves of the screen appeared of equal brightness. The distances of the lamps or lights from the screen were measured, and a proportion formed according to the law of the inverse squares. The screen, which was at first opaque, in later instruments was supplanted by one of ground glass, oiled paper, or other translucent material. An instrument based on the same principle which is in some respects modified is shown in the accompanying diagram (Fig. 2). Here A and B are the two illuminants,

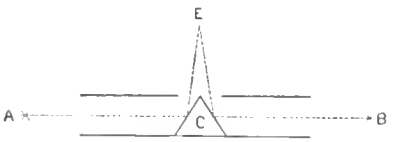


FIG. 2.

as before, and the rays of light fall on the surfaces of the prism C. The two lights are moved so that the surfaces of the prism appear equally illuminated to the eye of the observer at E. A simple and effective photometer was devised by Lambert in 1760, but as it was used extensively by Rumford some years later, it is known by his name. It consists of a vertical screen with a white surface, in front of which stands a cylindrical stick. The lights to be compared are placed in front of this stick, so that each will cast a shadow on the screen. These shadows represent the amount of light furnished by but one of the sources, consequently by varying the distances of the lights from the screen a position can be obtained where they furnish shadows of equal intensity. Measuring the distances of the lights from the screen, squaring the numbers, and forming a proportion, we can compare the intensity of the two illuminants. A second screen with an aperture cut in it may be placed parallel to the first with the lights in front of it

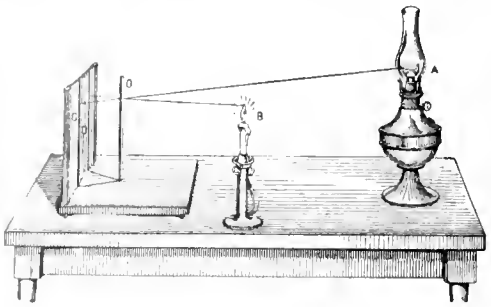


FIG. 3. RUMFORD PHOTOMETER.

and some little distance apart, so that each illuminates the screen by means of rays sent through the aperture. The two separate spots of light on the screen can be made equal by adjusting the lights and their comparative intensity computed as before. The photometer in most general use is that of Bunsen, where the two lights to be compared, A and B, are placed at the

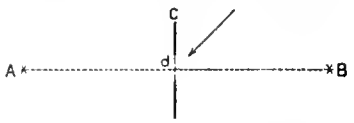


FIG. 4. BUNSEN PHOTOMETER.

opposite ends of the apparatus and a screen, C, whose face is perpendicular to the incident rays can be moved to and fro between them. This screen is made of a sheet of white paper with a central spot, *d*, produced by oil or grease, which appears bright on a dark ground by transmitted light, and dark on a light ground by reflected light. When the transmitted and reflected lights are equal in intensity the spot should disappear and the surface of the paper appear uniform, but in actual practice this condition is not realized. The sheet of paper is usually mounted in a box or carriage with mirrors or prisms enabling the observer to see simultaneously both sides of the paper, and is moved along a scale between the two lights, which is either graduated in units of length or indicates candle power direct. The reading is taken when the spot disappears as nearly as possible, and the candle power or relative intensity is determined as in the other cases. The arrangement of the lights, of course, varies in different forms of the instrument, as does also the construction of the box carrying the screen, but in general the results do not possess a greater accuracy than 4 or 5 per cent. The Rumford photometer cannot be depended upon closer than 8 or 10 per cent., but in all classes of photometric work much depends upon the observer.

The most modern and accurate photometer is that of Lummer and Brodhun, in which the central spot disappears entirely when the lights are of equal intensity. This is accomplished by the use of two right-angled prisms, one, E, with its hypothenusal face plane, the other, F, with this face ground spherical except in the centre, where a circular spot is perfectly plane. The two prisms are then placed with their hypothenusal sides adjacent, but separated except at the centre,

where the plane ground surface of the second prism is in contact with that of the other. The lights are placed at opposite ends of the apparatus, as in the case of the Bunsen photometer,

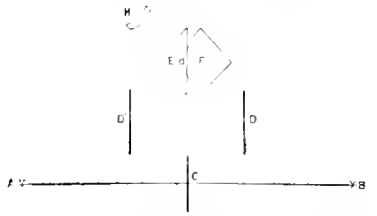


FIG. 5. PLAN OF LUMMER-BRODHUN PHOTOMETER.

and the rays fall on a central opaque screen, C, from which they are reflected to mirrors, D and D', and then to the faces of the prism. The rays from B entering the prism F, which has a spherical surface, undergo total reflection, except at the central portion (*d*), where the glasses are in contact. Therefore, only the rays passing through this central portion enter the second prism, E, and produce a spot of light of elliptical shape on its opposite surface. The rays from the other source of light, A, are reflected into the prism E, and by total reflection at the hypothenuse are brought to the third face of the prism, except those falling on the surface of contact, which enter the prism F. Consequently we have the surface of the prism E nearest the observer illuminated in part by the rays from one source of light and in part by rays from the other. If the illuminant to the left of the observer, for example, is of greater intensity, then we have a bright spot on a dark ground, and reversing the conditions the dark spot surrounded by light. When the lights are of equal intensity the spot entirely disappears and the field is uniform. The Lummer-Brodhun screen is usually mounted on a carriage which can be moved along a scale and which is easily reversed as a check on the observations. It also has a telescope, H, to observe the surface of the prism, which is a distinct advantage, as it permits the use of one eye and enables the observer to decide more accurately when the spot disappears.

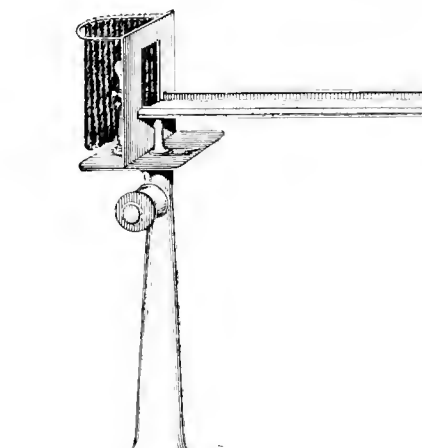


FIG. 6. LUMMER-BRODHUN PHOTOMETER.

The main difficulty in photometry is the comparison of lights of different colors, as then the determination of equally illuminated surfaces is an extremely difficult matter. For this purpose Rood, employing a principle first made use of by Whitman, has devised a 'flicker photometer' in which the light from two different sources is presented alternately to the eye in rapid succession. When the flicker disappears, it is shown that the light coming from one source is equal in intensity to that from the other.

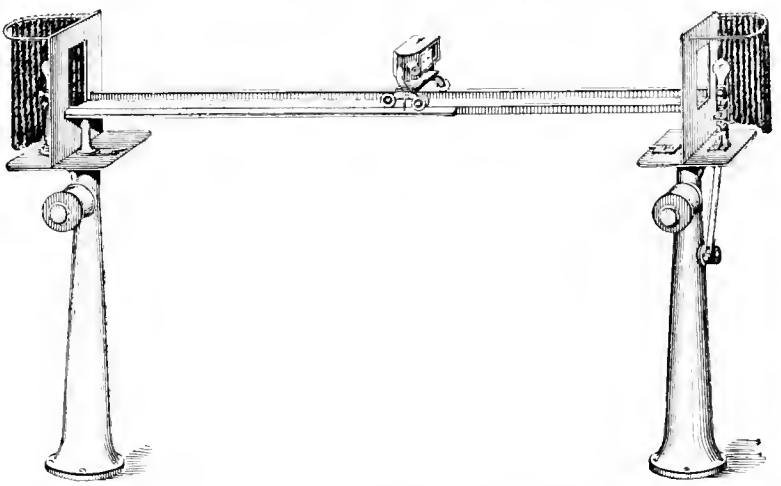


FIG. 7. LUMMER-BRODHUN PHOTOMETER ARRANGED FOR TESTING INCANDESCENT ELECTRIC LAMPS.

STANDARDS OF LIGHT. The question of standards of light possesses an intimate and important connection with photometry, and is a subject which is still attracting much attention from physicists. Until the International Congress on Electrical Units in 1883 adopted as the absolute standard the amount of light emitted by a square centimeter of melted platinum at the point of solidification, there was no really scientific unit in general use. Numerous forms of candles and lamps were employed, but little reliability could be placed on the results obtained in such tests and they did not form a satisfactory basis for subsequent or independent determinations. In France the standard used in photometric tests was the Carcel lamp, which burned purified rapeseed oil. The lamp was constructed according to certain fixed specifications, but it did not appeal to scientific men universally as an accurate standard. Candles have been used for a number of years as standards in spite of their many shortcomings; and we are now accustomed to have our electric and other lights rated in candle power. The candle in use in the United States

and England for photometric tests is the standard spermaceti candle, which burns 120 grains of material per hour and six of which weigh one pound. When this is prepared according to certain specifications as to size and form of wick, and burns with a flame 45 millimeters in height, the light emitted is considered unity. The stearin star candle was used in France and a somewhat similar candle in Germany, while a paraffin candle known as the *Vereinskerze* on account of its being adopted by the Union of German Gas Men was used in Germany and Austro-Hungary. The standard now commonly used in Germany is the acetate of amyl lamp of Hefner, which can be so adjusted as to be equivalent to the English candle. In practical photometry secondary standards consisting of incandescent lamps which have been standardized by comparison with some fundamental standard are used, and ordinary lamps are tested by reference to them.

Consult: Palaz, *Industrial Photometry*, translated by Patterson (New York, 1894); Stine, *Photometrical Measurements* (ib., 1900); *Record of the International Congress of Physicists, 1900* (Paris, 1901).

PHOTOPHONE (from Gk. *φῶς*, *phōs*, light + *φωνή*, *phōnē*, voice), RADIOPHONE, or SPECTROPHONE. Instruments in which radiant energy in the form of light acts to produce sound were devised by Prof. Alexander Graham Bell (q.v.) in conjunction with Sumner Tainter. The invention of the photophone arose from the employment of Willoughby Smith of selenium (q.v.) as a resistance medium in testing submarine cables. It was found that the electrical resistance of selenium varied considerably, and the discovery was made that this was due to the action of light, which lessened the resistance. Werner Siemens (in 1875) produced some extremely sensitive varieties of selenium, and in some of his experiments the resistance on exposure to light was found to be only one-fifteenth of what it was in the dark. Professor Bell substituted the telephone for the galvanometer and used intermittent flashes of light to produce a succession of changes in the conductivity of the selenium, corresponding in frequency to the musical vibrations within the limits of hearing, as it appeared to him that all the audible effects obtained from electricity could also be produced by variations in the light acting on selenium. He perceived the effect could be produced at the extreme distance at which selenium would respond to the action of a luminous body, and that this distance could be indefinitely increased by the use of a parallel beam of light, so that it would be possible to telephone from one place to another without a conducting wire, were apparatus devised by which variations could be produced in a parallel beam of light, corresponding to the variations in the air produced by the voice. After a number of experiments in which the resistance of the selenium cells was greatly reduced and other difficulties overcome, a form of photophone was devised in which light reflected from a plain mirror of flexible material, such as silvered mica or a microscope cover glass, against the back of which the speaker's voice is directed, was caused to vibrate with a frequency corresponding to that of the diaphragm itself. For reproducing sound at a distance sunlight or any other powerful light may be used, and a large beam is concentrated by means of a lens upon the diaphragm mirror, which after reflection is again rendered parallel by means of another lens. The beam is received at a distant station upon a parabolic reflector, in the focus of which is placed a sensitive selenium cell, connected in a local circuit with a battery and a telephone. The loudest effects were produced by rapidly interrupting the beam of light by a perforated rotating disk, revolving over the face of another perforated disk, with holes corresponding. These experiments led to others with substances other than selenium, and without the use of telephone or battery. A thin sheet of hard rubber was held close to the ear while a beam of intermittent light was thrown upon it by a lens, the result being the production of a musical note, and this effect was intensified by arranging the hard rubber as a diaphragm and listening through a hearing-tube. The conclusion was reached that sounds could be produced by the action of a variable light from substances of all kinds when in form of thin diaphragms. Subsequently Professor Bell concluded that sonorousness under the influence of intermittent light was a property of all matter. Various experiments with different fibrous and porous materials, such as cotton-wool, worsted, silks, sponge, lampblack, etc., indicated that lampblack may be substituted for selenium in an electrical receiver. In France, M. Mercadier passed an intermittent beam from an electric lamp through a prism and found a difference in the audible effects in different parts of the spectrum. These experiments were repeated by Professor Bell, who ascertained that sounds were obtained in every part of the visible spectrum excepting the extreme half of the violet, as well as in the ultra-red. A continuous increase in the loudness of the sound was observed upon moving the receiver gradually from the violet into the ultra-red, corresponding exactly with the proportion of heat in different parts of the spectrum, and showing that these effects are produced by the heat which accompanies light. Beyond this point the sound began to decrease, and then stopped so suddenly that a very slight motion of the receiver made all the difference between almost maximum sound and complete silence. Experiments with various substances led to the conclusion that the nature of the rays that produce sonorous effects in different substances depends upon the nature of the substances that are exposed to the beam, and that the sounds are in every case due to those rays of the spectrum that are absorbed by the body. These considerations led Professor Bell to construct a new instrument for use in spectrum analysis, which he termed a 'spectrophone.' The eyepiece of a spectroscope was removed and sensitive substances were placed in the focal point of the instrument behind an opaque diaphragm containing a slit. These substances are put in communication with the ear by means of a hearing-tube, and if we smoke the interior of our spectrophonic receiver and fill the cavity with peroxide of nitrogen gas, we have then a combination that gives us good sounds in all parts of the spectrum, visible and invisible, except the ultra-violet. Now pass a rapidly interrupted beam of light through some substance whose absorption spectrum is to be investigated, and bands of sound and silence are observed upon exploring the spectrum, the silent positions corresponding to the absorption bands. The ear cannot compete with the eye in the examination

of the visible part of the spectrum; but in the invisible part beyond the red the method is applicable. In working in this region of the spectrum, lampblack alone may be used in the spectrophonic receiver. Professor Bell stated that the spectrophone was only an adjunct to the spectroscope, but he considered that it would have a wide and independent field of usefulness in the investigation of absorption spectra in the ultra-red.

PHOTO-SCULPTURE. An ingenious use of photography to assist a sculptor in modeling portrait statues, or fac-similes and reduced reproductions of other statues, invented by M. Willème in 1867. The subject stands in the centre of a circular chamber, and is simultaneously photographed by no less than 24 cameras, arranged at equal distances round the chamber. The 24 photographs are subsequently made available in the sculptor's studio, where the clay model is arranged on a frame capable of being turned round. A magic lantern throws the outline of photograph No. 1 on a screen in front of the artist, who by means of a pantograph brings this outline to bear on the clay in its first position. The model is then turned round one twenty-fourth of a revolution, and the outline of photograph No. 2 is taken advantage of. Thus the modeler works his way in 24 changes round the model, and the likeness or fac-simile or reduced figure of the original is or should be complete. The method has been also applied to the taking of medallions and the like.

PHOTOSYNTAX (from Gk. *φῶς*, *phōs*, light + *σύνταξις*, *syntaxis*, arrangement). The first special term proposed (1893) to designate the process of the manufacture of carbohydrate food by green leaves under the influence of light. See PHOTOSYNTHESIS.

PHOTOSYNTHESIS (Neo-Lat., from Gk. *φῶς*, *phōs*, light + *σύνθεσις*, *synthesis*, combination). The process by which the green parts of plants construct carbohydrates under the influence of light. Carbohydrates are substances like sugars, starch, etc., which serve as the most important foods, both for plants and animals. The materials out of which the plant builds these foods are carbon dioxid and water. The idea current in the middle of the last century, and persisting even yet, that plants obtain their carbon compounds chiefly from the soil is erroneous. Few of the materials absorbed from the soil are fairly to be considered as foods. Carbon dioxid is present in normal air in minute quantities, usually less than three parts in 10,000. Yet it is absorbed by the aerial parts of plants, particularly the leaves, in sufficient quantities, because it finds its way by diffusion at high speed through the minute openings in the epidermis (stomata, q.v.) into the intercellular spaces which are bounded by moist cell walls. (See AËRATION.) In the water of these it readily dissolves and diffuses to the interior of the cells, where under proper illumination it is being used as rapidly as it can be absorbed. (See ABSORPTION.) It is not possible for the carbon dioxid to be dissolved in any considerable quantity by the superficial cells themselves, since the walls of these are more or less completely waterproofed to prevent evaporation. This effectually prevents solution and consequent diffusion of the carbon dioxide. The water necessary for food-making is obtained by absorption (q.v.) through the roots. The amount requisite for this purpose, however, is very small in comparison with the great quantities needed to replace that lost by evaporation. (See TRANSPIRATION.) Carbon dioxide does not merely dissolve in the water, but enters into loose chemical union with it, producing carbonic acid, which is highly unstable, as compared with the very stable carbon dioxide. Therefore it may be readily decomposed and its components rearranged to form a new substance. This is done by the living protoplasm.

The necessary energy is only obtainable when the plant is supplied with light of sufficient intensity. To obtain the requisite energy plants have developed in the cells lying near the surface minute protoplasmic bodies called chloroplasts, holding various green and yellowish pigments called collectively chlorophyll (q.v.). These pigments absorb only certain wave lengths of light, as shown in the accompanying absorption spectrum (Fig. 1). They derive their sole significance from their association with the living protoplasm, or enzymes (q.v.) produced by it. Like chemical action may be produced by protoplasm when energy is supplied to it in other ways, or when radiant energy of different wave lengths than that absorbed by chlorophyll is obtained. Thus certain bacteria containing purple pigments absorb some of the invisible ultra red rays, and these organisms are said to produce carbohydrates.

FIG. 1. THE ABSORPTION SPECTRUM OF CHLOROPHYLL.
The most important absorption bands are the three regions near the B, C, and D lines. The absorption to the right of the F line is faint and not easy to resolve into three bands. It seems to be due mainly to carotin.

It is possible to determine in some measure the influence of light waves of different lengths. It appears that the most efficient wave lengths are those which appear as red, orange, and yellow to our eyes. It has been clearly shown that absorbed light supplies the energy and that the chloroplasts do not act merely as a screen to cut off injurious or useless radiations, a theory which was once maintained with some vigor. The intensity of light adequate for photosynthesis approaches that of the brightest diffuse daylight. No plants are able in nature to secure sufficient carbon dioxide to utilize all the energy obtained from direct sunlight, though many of them are adapted to such conditions. Photosynthesis is nearly proportional to the intensity of the light, and though it is observable by proper methods in twilight, it has not yet been observed in so weak illumination as full moonlight. Artificial lights of various kinds are efficient in proportion to their intensity. Horticultural experiments in the United States and England have shown that electric light may be used for forcing certain plants in winter to a more vigorous development of foliage and vegetative organs. See ELECTRO-CULTURE OF PLANTS.

Scarcely any two cells of the plant receive the same amount of light. Those, therefore, which lie on the upper side and are first reached by the light are in the most favorable position for photosynthesis. As many as possible are developed by

leaves in [illegible] position. Indeed, the palisade region (see LEAF) depends for its mode of development on the action of light. The internal cells, receiving only that which has passed one or more external layers, work at a slower rate, although they are usually better situated for receiving an adequate supply of carbon dioxide. Window plants, receiving the light only from a very limited portion of the sky, at most 30 to 50 per cent., are usually more or less starved, because the energy received is inadequate in amount for the necessary food making. A comparison of the total energy received by the leaf and the amount stored in the carbohydrates formed shows that a relatively small amount of the kinetic energy has become potential in these compounds. Inability to determine the exact quantity of carbohydrate formed and to separate the energy absorbed by the chloroplasts from that absorbed by the other portions of the plant make such computations uncertain. From them, however, it appears that 1 per cent. or less of the total energy received by the leaf reappears in the starch of starch-producing leaves. The products of photosynthesis are probably unlike in different plants. Starch is often spoken of as the chief product of this process. It is probably not only a secondary product of photosynthesis, but it is certain that many plants do not form it at all. Most of the larger seaweeds, for example, make other carbohydrates and much of the carbohydrate food in the ordinary land plants is in the form of sugars, cellulose, gums, etc.

Practically nothing is certainly known of the details of the process of photosynthesis or of its first product. Several theories have been proposed; the most plausible is that of Baeyer, which has recently been receiving substantial support, although it is by no means yet clearly established. According to this theory the rearrangement of the elements of carbonic acid (H_2CO_3) results in the formation of formaldehyde (CH_2O) with the elimination of oxygen (O_2). After the production of formaldehyde it is condensed (or 'polymerized') into one of the simpler sugars, such as glucose ($C_6H_{12}O_6$), which could be formed by the proper union of six molecules of formaldehyde. This again could be polymerized to form cane sugar, and cane sugar has been shown to be one of the early products of photosynthesis in a number of ordinary leaves. Starch, which is a very complex carbohydrate, must result from further compounding, and therefore can be looked upon only as a still more remote product. Some of the supports for Baeyer's hypothesis are as follows: First, green leaves and even uninjured seedlings have been supplied directly with glucose, with the result that they nourish themselves therewith and store up reserve starch; second, it has been possible to supply one of the products intermediate between formaldehyde and glucose, namely glycerose ($C_3H_6O_3$), to starved plants in the absence of CO_2, with the result that they nourish themselves and store up starch; third, formaldehyde, though under ordinary conditions a violent poison, has been supplied at the moment of its formation to an alga and the plant nourished thereby; fourth, formaldehyde has recently been detected in the green leaves of active plants; fifth, formaldehyde is produced from CO_2 in light in liquid containing leaf-enzymes and chlorophyll, though no living protoplasm be present. Such experiments, while not conclusive, strongly support the idea that formaldehyde is the first product of photosynthesis.

The by-product of photosynthesis, oxygen, is nearly equal in volume to that of the carbon dioxide absorbed. On the average it is a little less, but in many experiments is at least 8 per cent. greater. In such cases the extra oxygen may be derived from the decomposition of other substances in the plant, since it is impossible to distinguish all sources of the evolved oxygen, which is always given off in the neutral (O_2).

It is not possible to ascertain exactly the amount of carbohydrates made under given conditions, since an indeterminate amount is used at once in the making of other more complex proteid foods, and still other indeterminate quantities are lost from any given region by migration. The net product has been determined in the sunflower as 1.6 to 1.8 grams of starch per hour per square meter; in the gourd, 1.5 to 1.7 grams; in the bramble, by a different method, 1.54 grams. The accumulation of the products of photosynthesis never reaches such a point in the normal plant that it interferes with the process. By artificial means, however, this result may be brought about. Since the supply of energy to a well-illuminated plant is more than sufficient to enable it to utilize all the carbon dioxide which can enter the cells under the usual small partial pressure of carbon dioxide, increasing the pressure of this in the atmosphere, and therefore supplying a greater quantity to the living cells, increases the amount of carbohydrates produced. This increase is almost proportional to the relative increase of CO_2, up to a point at which this gas retards other functions. An increase of CO_2 in the atmosphere from 3 parts in 10,000 to 600 or 800 parts proves beneficial for photosynthesis. Variations in other conditions, however, may so greatly affect this that inconsistent results may be obtained from experiments.

The rate of photosynthesis is affected by the temperature, increasing with a rising temperature to an optimum, which is not far from the optimum for growth. Yet it must be remembered that many plants flourish, and therefore may make food, at very low temperatures, e.g. the algæ in Arctic waters, or at very high temperatures, e.g. algæ in hot springs. In conifers, photosynthesis has been reported as occurring at temperatures even below 0° C. Though the leaves and surface tissues of plants are especially liable to lose water, and therefore to become flaccid, no interference with photosynthesis results.

PHOTOTAXIS (Neo-Lat., from Gk. *φῶς, phōs,* light + *τάξις, taxis,* arrangement, from *τάσσειν, tassein,* to arrange). (1) In animals, control of the direction of locomotion by light. Like the unicellular plants, the Protozoa as well as higher animals may migrate in a direction determined by that of the rays of light. According as the migration is toward or from the source of light, we can distinguish positive and negative phototaxis. The flagellate Infusoria (Chilomonas and Euglena) will move toward the light, crowding together on the illuminated side of the vessel. Amœba has been observed by Davenport to be strongly phototactic, showing that such responsiveness is a general property of protoplasm, the result of chemical changes produced by light. Ciliate infusorians are not markedly phototactic. Cells containing such different kinds of pigment

as the chlorophyll of plants and the retinal pigment of the eyes of arthropods respond to the action of light in a similar way, this response being an adaptive one. A striking example of phototaxis in pigmented cells (chromatophores) is described by Keller. He has discovered that the dark color of the (illuminated) skin is due to the rich branching at the base of the epidermis of black pigment cells lying deep in the cutis. In the dark, the pigment granules stream out of the branches into the cell-body, but the branches themselves are undisturbed. So long as the black pigment has this central position, the skin appears whitish. The light, on the contrary, causes the pigment, which is probably carried passively in the plasma, to move centrifugally. (See PIGMENT.) Hydra was observed by Trembley to wander toward the light, and this is of advantage to the animal because many of the Entomostraca on which it feeds are also phototactic. So also is the starfish. The phenomenon is especially marked in bilateral animals, such as planarians, annelids, crustaceans, flies and many other insects, mollusks, and vertebrates. As Davenport states, animals which live in shady places or in the dark are negatively phototactic, i.e. shun the light, while those living in the light are positively phototactic. The house-fly is well known to be phototactic, but its maggot shuns the light. Butterflies, says Davenport, are attuned to a high intensity of light, moths to a low intensity, so that bright sunlight, which calls forth the one, causes the other to retreat. On the other hand, a light like that of a candle, so weak as not to stimulate a butterfly, produces a marked response in the moth. The males and females of ants have been observed while mating in the air to be strongly phototactic, but after that period they show themselves neutral (Loeb). The larvæ (nauplii) of barnacles as well as other pelagic animals rise to the surface of the sea during the night, but descend before the strong sunlight. Temperature also affects phototaxis; a low temperature causes several of the normal responses, while under a high temperature it is accelerated; also Loeb has found that a concentrated medium, as when the water is rendered more salt, acts as the lower temperature. It is thought that, while in the retina of the eye the protoplasm is specialized for perceiving light, there is some evidence that in the eyeless animals the whole surface of the body contains such light-perceiving substances. This is well known to be the case with the earthworms, and perhaps with the oyster, Pholas, Unio, etc. The pelecypod Psammobia, the blind Proteus of caves, and Triton cristatus when blinded, are irritated by rays of light, especially the blue rays, falling on the skin. Consult Davenport, *Experimental Morphology*, part i. (New York, 1897), which contains a full bibliography. Compare TROPISM.

(2) In plants, the sensitiveness to illumination. This may be fundamentally the same as heliotropism (q.v.). The effect of light upon the organism may be to accelerate or retard the movements of the motor organs on the illuminated side, this causing the body to be rotated until both sides are equally illuminated (see CHEMOTAXIS and CHEMOTROPISM), when any progress will then necessarily be toward or away from the source of light. Organisms which approach the source of light are said to be positively phototactic, those which recede from it negatively so. The same organism may show successively both forms of response in light of different intensity. For instance, Euglena viridis is positively phototactic in weak light, but negatively so in strong.

PHOTOTHERAPY (from Gk. *φῶς, phōs*, light + *θεραπεία, therapeia*, cure, from *θεραπεύειν, therapeuein*, to cure, from *θεράπων, therapōn*, attendant). Treatment of disease by means of light. The method of applying light for therapeutic purposes, devised by Dr. Niels R. Finsen, of Copenhagen, about 1896, is founded on the following data: (1) The bactericidal property of the chemical rays of light; (2) the power of the chemical rays of light to produce an inflammation of the skin (sunburn, *erythema solare*); (3) the power of the chemical rays of light to penetrate the skin. The violet and ultra-violet rays of light obtained from the sun or from an electric arc-lamp will, in a few hours, kill plate cultures of Bacillus prodigiosus at a great distance. The so-called sunburn is not a burn. If sunlight or electric light be passed through a layer of distilled water so arranged as to cut out the ultra-red rays (the dark rays of heat), the resulting skin-inflammation is as great as if the light were uncontrolled. If sunlight be thrown upon the skin through a glass screen which cuts out the violet and ultra-violet rays, there is no resulting inflammation. Again, if small sealed bottles containing muriate of silver be placed under the skin of some animals kept in the dark, and of some animals exposed to the sun, if the tubes be removed an hour later, it will be found that the muriate of silver is blackened in the cases of the animals which were exposed to the sunlight, but not in the cases of those kept in the dark. It is shown by experiment that the chemical rays of light penetrate more easily in bloodless tissues than in those filled with blood. In a piece of sensitized paper put against the back of a man's ear upon the front of which the blue and violet rays are allowed to fall for 5 minutes, no reaction takes place. If the paper be replaced and the ear be compressed tightly between two glass plates and exposed again to the same light, the paper will be blackened after 20 seconds' exposure. In the treatment of patients, sunlight is used in the summer, when the sky is bright, but otherwise the light of electric arc-lamps of 50 to 80 amperes is employed. Concentration of the light is necessary to render it powerful as a bactericide. To avoid burning the skin, the light must be colored. To make the sunlight strong and cool Finsen devised a special apparatus, consisting of a lens about 20 to 40 centimeters in diameter. The lens, composed of a plain glass and a curved one, is framed in a brass ring, with a bright blue, weak ammoniacal solution of sulphate of copper between them. The water absorbs the ultra-red rays and, being blue, it excludes much of the red and yellow rays. The excluded heat rays have little bactericidal power; whereas the blue, violet, and ultra-violet rays are but slightly impaired in chemical or bactericidal power. The lens is so hung that it can be raised and lowered as well as turned on a vertical and horizontal axis, by which means it can be placed perpendicularly to the sun's rays, and at such a distance as to make the light strike the diseased area. For concentrating the electric arc-light Finsen devised an

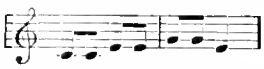
apparatus consisting of lenses of quartz framed in two brass tubes, telescoping the one within the other. Quartz allows the ultra violet rays (even those of very short wave-length) to pass through it much more easily than through glass, and these rays from the electric light are of less length than those from sunlight. Facing the lamp are placed two lenses having together a focal distance of 12 centimeters. At this distance from the lamp, those lenses will concentrate and render parallel the divergent rays from the lamp, and direct them through the brass tubes, at whose distal end they strike two quartz lenses. These lenses concentrate the parallel rays and converge them till they are united about 10 centimeters beyond the outer lens. The space between these latter lenses is filled with distilled water which absorbs the ultra-red rays, but does not impair the blue, violet, and ultra-violet rays. Surrounding this end of the apparatus is a mantle, through which cold water flows to prevent boiling of the distilled water between the lenses. In spite of all this precaution, the light is still too warm, and the skin must be cooled to avoid burning. This is effected by an apparatus consisting of a plate of quartz and a plain convex lens of quartz, both fitted into a conical brass ring, which carries two small tubes and four arms. To each arm is fastened an elastic band by means of which the apparatus is pressed against the skin. Cold water is run into one tube and out of the other, and thus the skin is cooled so that it can tolerate the strongest light. The pressure of the plano-convex lens on the skin renders it anæmic, thus fitting it for the easy penetration of the chemical rays. A small area of the skin is treated for an hour each day. The skin swells and becomes red, and a bulla may appear; but sloughing has not resulted. During the application the nurses are obliged to wear dark glasses to protect their eyes from the brilliant light. Dilatation of cutaneous vessels by the violet rays may continue for six months. Many diseases of supposed bacterial origin have been treated by this method, but cures have resulted only in cases of *lupus vulgaris, lupus erythematosus, alopecia areata, and carcinoma.* The greatest success has been reached in cases where there was an absence of scarring, of pigmentation, of great vascularity, of great depth below the surface, of involvement of eyelid or mucous membranes, or of great extent of lesion.

The number of patients at Finsen's Institute has increased from seven in 1897 to an unnumbered clientèle, with over a hundred on a waiting list. A Brooklyn, N. Y., physician has opened an institute for Finsen's treatment. The Roentgen or X rays (q.v.) penetrate to deep layers not reached by sunlight or electric light. Consult Morris & Dore, "Finsen's Light Treatment of Lupus and Rodent Ulcer," in *British Medical Journal*, February 9, 1901.

PHOTOTROPISM (from Gk. *φῶς, phōs*, light + *τροπή, tropē*, a turning, from *τρέπειν, trepein*, to turn). A sensitiveness of plant organs to light, by virtue of which they bend to assume definite positions with reference to the direction of light incident upon them. See HELIOTROPISM.

PHRANZA, frän'zä, or **PHRANZES**, frän'zēs (Gk. *Φραντζῆ, Phrantzē*). George (1401-78). A Byzantine historian, born at Constantinople. He was secretary to the Emperor, Manuel II., and held other high offices, but at the fall of Constantinople was obliged to flee, and ended his days in an Italian monastery, where he wrote his valuable *Chronicle*, embracing the period of Byzantine history from 1259 to 1477. It was printed in Vienna in 1796, and translated into Latin in 1838.

PHRASE (Lat. *phrasis*, from Gk. *φράσις*, manner of speech, from *φράζειν, phrazein*, to declare). The name given, in music, to the simple motives containing in themselves no satisfactory musical idea, which enter into the composition of every melody containing a perfect musical idea, e.g.



The phrase most usually consists of two measures; in compound time it may be comprised in one measure, and an extended phrase is one which contains three measures. In the more simple and regular forms of musical composition, two phrases unite to form a section, ending in a cadence, and a perfect musical idea is formed of two such sections terminating, the first with the dominant, the second with the tonic harmony. See FORM.

PHRASING. The proper rendering of musical phrases. (See PHRASE.) A musical composition is analogous to a literary one, the sentences being replaced by phrases; upon their correct interpretation depends the intelligible presentation of the whole piece. One of the most important elements of phrasing is accent (q.v.), the general principles of which will be found under RHYTHM; but in no case must an accent be so insisted upon as to break the unity of the musical phrase. On the contrary, the ordinary accent is often postponed or anticipated in order to emphasize the general effect of the phrase. For the same reason, especially in rapid passages, accents are often added; while in quick movements accents are sometimes omitted so as to give an impression of unity to a number of separate bars. Two common faults in phrasing are breaking up a group of notes which together form a musical sentence, and running together two distinct sentences. In instrumental work, especially, there is a tendency to make a break at the end of a bar; but in reality a sentence always ends on the accented division of a bar, the bar-stroke having absolutely no relation to phrasing. In vocal music the musical accents correspond with those of the text, and the phrases are, as a rule, dependent upon the lines or word sentences. Vocal phrasing, therefore, is obviously much simpler than instrumental. The signs most commonly used to indicate phrasing are the dash; the curved line, denoting *legato;* and the slur; but the interpretation of any composition is to a great extent a matter of personal appreciation and discrimination. For some helpful suggestions on the subject, consult: Ehrenfechter, *Delivery in the Art of Pianoforte Playing* (London, 1897); Goodrich, *Theory of Interpretation* (Philadelphia, 1899); Lussy, *Traité de l'expression musicale* (6th ed., Paris, 1892).

PHRENOL'OGY (from Gk. *φρήν, phrēn*, heart, mind + *-λογία, logia*, account, from *λέγειν, legein*, to say). The theory that the mind consists of a number of independent faculties, each of which has a definite localization in a region

of the brain whose size is indicative of the degree of the faculty resident in it. Franz Joseph Gall (q.v.), an eccentric Viennese physician, announced about 1796 the discovery of a system of phrenology. He asserted that he had arrived at his results empirically, having for several years examined the heads of individuals who exhibited unusual mental or moral endowments. By these examinations he made out a system of correlations between the topography of the skull and the traits. He further concluded that the size and configuration of the brain was indicated by the size and configuration of the skull. His lectures, begun in 1796, ceased at the order of the Austrian Government in 1802, his doctrines being judged to be materialistic and inimical to the truths of morality and religion. In 1804 he associated with him his favorite pupil, Johann Gaspar Spurzheim (q.v.), and the two traveled through Germany, Prussia, and Switzerland to France. In Paris, the French Institute appointed a commission to investigate their assertions. This commission reported favorably upon certain methods of dissection, etc., but regarded their main conclusions as hypothetical. In 1809 the two began publishing a large work, *The Anatomy and Physiology of the Nervous System in General, and of the Brain in Particular, with Observations upon the Possibility of Ascertaining Several Intellectual and Moral Dispositions of Man and Animals by the Configuration of Their Heads*. Gall died in Paris in 1828, and was interred with the greatest marks of respect and honor. Spurzheim came to America in 1832, but died suddenly shortly after his arrival at Boston.

The fundamental tenets of phrenology are that the brain is the material substratum of mind, that it is a multiplex structure, composed of a definite number (originally 34, now 42) of constituent organs, each of which is the seat of a particular power of the mind—a 'sentiment,' a 'propensity,' or an 'intellectual faculty.' Furthermore, phrenology teaches that these 42 organs, or pairs of organs, constitute a series of cones with their apices at the oblongata and their bases at the surface. Each prominence in the skull indicates the size of the organ just beneath it, and in that way the development of the correlated mental faculty; for this development varies directly with the volume of its brain substrate, and, conversely, the exercise of any faculty promotes the growth of its brain seat. The 'propensities' or 'passions,' situated at the lower and posterior part of the brain, are amativeness, philoprogenitiveness, continuity, adhesiveness or friendship, combativeness, destructiveness, constructiveness, acquisitiveness, secretiveness, inhabitiveness, alimentiveness, vitativeness, and conjugal love. The 'sentiments,' situated at the superior portion of the cranium, are self-esteem, love of approbation, cautiousness, firmness, benevolence, veneration, hope, ideality, conscientiousness, spirituality, and sublimity. The 'intellectual faculties,' in the anterior region, are individuality, form, space or size, weight or resistance, color, locality, order, duration, number, tune, language, comparison, causality, wit, imitation, supernaturality or wonder, human nature, and suavity. In actual diagnosis, the size of the prominence determined the degree of the faculty only when taken in conjunction with other tendencies, for one faculty might aid or inhibit the function of another.

It is scarcely necessary to say that, as a pretension to a science, phrenology is related to modern neurology as astrology to astronomy, or alchemy to chemistry. It did, indeed, serve a useful purpose in stimulating the investigation of cortical function, in instilling the principle of the dependence of consciousness upon the cerebrum, and in offsetting the extreme views of men like Magendie and Flourens, who believed that the brain functioned homogeneously like the lungs or the liver. But in the light of modern knowledge phrenology is bad psychology and bad neurology. Modern psychology does not regard the mind as a bundle of faculties. Its components are determined rather by the contributions of the various sense-organs to its structure than by the types of activity by which the psychological self seems to acquire knowledge or express its attitude. Neurologically, too, there are many disproofs of phrenology. Different skulls have a different thickness; the same skull varies in thickness in different regions; prominences on the surface do not necessarily indicate a greater size in the part of the brain beneath; there is no correlation between brain weight and intelligence; three-fifths of the gray matter of the cortex is concealed in the sulci; loss of portions of the brain by accident or disease destroys or impairs the sensory or motor functions connected with some sense department, or some association system, not some 'faculty.' Finally, the whole structure of phrenology falls with the modern investigations of cortical localization by the methods of degeneration, electrical stimulation, medullation, and extirpation. See PHYSIOLOGY.

BIBLIOGRAPHY. Sewall, *An Examination of Phrenology* (Washington, 1837); *Phrenological Journal*, xxxi. 4 (New York, 1885); Barker, *The Nervous System* (New York, 1899); Donaldson, *The Growth of the Brain* (New York, 1895); Holländer, *Historisches über die Localisation der psychischen Thatigkeiten im Gehirn, mit besonderer Berücksichtigung der Lehren Galls* (Berlin, 1899).

PHRIXUS (Lat., from Gk. Φρίξος). The son of Athamas and Nephele. With his sister Helle he was rescued by his mother when about to be sacrificed to Zeus, and carried to Colchis upon a ram with golden fleece. On the journey Helle fell into the waters called after her, the Hellespont. The fleece of the ram, given to King Aëtes and hung upon the grove of Ares, was the object of the Argonautic Expedition.

PHRYGIA, frij'i-ä (Lat., from Gk. Φρυγία). A country in Asia Minor, the extent and boundaries of which varied very much at different periods of ancient history. Originally, the boundaries toward the east were the river Halys and the territory about Iconium, which was the last Phrygian city; toward the south, it touched the Taurus and the Pisidian Mountains; on the north, it reached the Hellespont and Propontis; on the west, it seems to have included the Troas and Mysia, and may have held suzerainty over Lydia and Caria. Later invaders from Thrace, who occupied Bithynia and Mysia, cut this region into two parts: Little Phrygia, a somewhat indefinite region south of the Hellespont, and Greater Phrygia, which alone preserved the national character. This was bounded on the north by Bithynia and Paphlagonia, on the east by Pisidia Lycaonia, on the south by Cappadocia, and on

the west by the maritime countries of Mysia, Lydia, and Caria. The boundaries were further modified by the Gallic invasion of the third century B.C. (See GALATIA.) Pergamene conquests added part of Southern Bithynia, including the important city of Dorylæum, under the name of Phrygia Epictetus. The Roman provincial administration divided Phrygia, attaching the northeastern part to the Province of Galatia and the western portion to the Province of Asia. Phrygia was in general a high and somewhat barren plateau, though its pastures supported immense flocks of sheep, noted for the fineness of their wool, as indeed they still are. The most fertile part was the valley of the Sangarius, but the most beautiful and populous district was the southwestern, at the base of the Taurus, where the Mæander and other streams had their rise, and here were the chief cities, Synnada, Celænæ, Apamæa, Colossæ, Laodicea, while farther to the east was Antioch. The mountains and streams yielded gold; Phrygian marble was anciently celebrated, and the cultivation of the vine appears to have been extensively carried on.

The Phrygians were certainly an Indo-European race, and seem to have entered Asia Minor from Thrace, pushing into the interior from the Troad along the valley of the Sangarius, and making themselves masters of the whole tableland, and probably extending their sway over the Asiatic tribes on the coast. We hear of a race of powerful kings alternately bearing the name of Gordius and Midas, and in the mountains near the headwaters of the Sangarius are the great rock-cut tombs or façades which were associated with these rulers. The invasions of the Cimmerians (c.675 B.C.) seem to have broken their power, and henceforth they played no part in history, but fell first under the rule of the growing Lydian kingdom, then under Persia, Macedon, Pergamum, and Rome. They seem to have been a peaceful rustic people, devoted to agriculture and cattle raising. Their religion was an ecstatic nature worship in which the Great Mother of the Gods, Rhea or Cybele, and a male deity, Sabazius, played a great part. The orgiastic rites and wild music seem to have exercised considerable influence upon the Greeks and Romans, and we find their deities transplanted to the Western world. Consult: Ramsay, *Historical Geography of Asia Minor* (London, 1890), and especially his incomplete work, *Cities and Bishopries of Phrygia* (Oxford, 1895-97).

PHRYGIAN CAP. See LIBERTY CAP.

PHRYGIAN LANGUAGE. The native language of the Phrygians is known partly through glosses preserved by Hesychius and other lexicographers and authors, partly through inscriptions found in the territory once occupied by this people. Tombs with inscriptions were discovered in the valley of Doghanla by Colonel Leake in 1820. Four of these inscriptions, including that on the sepulchre of King Midas, were first published by Hamilton in 1842. A number of additional inscriptions were published by Ramsay in 1883 and others copied by himself and Sterrett appeared subsequently. Many of these are in Greek, but have Phrygian additions at the end. That the additions contain formulas of execration was first surmised by Schmidt in 1869. The researches of Ramsay and Fick have corroborated this conjecture. As Herodotus (vii., 73) and Strabo (xlvii., cexcv.) declare that the Phrygians were related to the Armenians and the Thracians, it was natural that the language should be supposed to be Armenian. That was done by Mordtmann and Gosche. A collection of 63 glosses was made by Lagarde. He concluded that the Phrygians were derived from the Thracians and that their Iranian character was proved by such words as *ἀδάμνα* and *κύρβαντ*. There seems to be good reason for assuming that the Phrygian language belonged to the Iranian family. While most of the monuments found belong to the Roman period, there are some that have plausibly been assigned by Ramsay to the end of the eighth century B.C. If one doubtful letter is a χ rather than a ψ, as seems probable, the Phrygians apparently received their alphabet, not from the Ionians, but from the old Æolians. After the Phrygian language had been supplanted by the Greek, it still maintained itself in imprecations, believed to be more efficacious in the speech of the fathers. The same alphabet has been found at Abu-Simbel in Egypt in inscriptions that must date from B.C. 650-590 and in an inscription found in Lemnos in 1886 in an unknown language and of uncertain age. Consult: Leake, *Journal of a Tour in Asia Minor* (London, 1824); Hamilton, *Researches in Asia Minor, Pontus, and Armenia* (ib., 1842); Stewart, *Ancient Monuments of Lydia and Phrygia* (ib., 1842); Lagarde, *Gesammelte Abhandlungen* (Leipzig, 1866); *Corpus Inscriptionum Græcarum*, iii. 3810, et seq.; Schmidt, *Neue lykische Studien* (Jena, 1869); Fick, "Zum Phrygischen," in Bezzenberger's *Beiträge*, xiv., 50; Ramsay, in *Journal of the Royal Asiatic Society*, xv. (London, 1883); id., in *Journal of Hellenic Studies* (London, 1882, 1884); id., in *Zeitschrift für vergleichende Sprachforschung*, xxviii. (Gütersloh, 1887).

PHRY'NE (Lat., from Gk. *Φρύνη*). One of the most celebrated courtesans of antiquity. She was a daughter of Epicles, and was born at Thespiæ, in Bœotia. She was of very humble origin, and is said originally to have gained her livelihood by gathering capers, but her beauty afterwards brought her such wealth that, when Alexander destroyed the walls of Thebes, she is said to have offered to rebuild them, if she might be allowed to inscribe on them the words: "Alexander destroyed them, but Phryne, the courtesan, rebuilt them." Being on one occasion accused by Euthias of profanation of the Eleusinian mysteries, she was summoned before the court of the Heliasts and was there defended by the orator Hyperides; but Hyperides, seeing that the verdict of the court was likely to be an unfavorable one, threw aside her veil and exposed her bosom and shoulders: the judges thereupon acquitted her, and she was carried in triumph to the Temple of Aphrodite. She served as the model for Praxiteles's Cnidian Venus, and for the Anadyomene (q.v.) of Apelles, she having, on the occasion of a festival at Eleusis, entered the sea, unclad, in the presence of the assembled throng. Her neighbors dedicated to her at Delphi a gilded statue resting on a base of Pentelic marble, the whole the work of Praxiteles. There is preserved in Athenæus an epigram in her praise written by Praxiteles and inscribed on a statue of Cupid, which he presented to her and which she dedicated at Thespiæ.

PHRYNICHUS, frĭn'ĭ-kŭs (Lat., from Gk. *Φρύνιχος*). A Greek tragic poet of Athens, an older contemporary of Æschylus. He won his first victory in B.C. 511 and his last in 476, when Themistocles was his *choragos*. Like Æschylus, he is said to have died in Sicily. In all the accounts of the rise and development of the tragedy, Phrynichus is ranked immediately after Thespis, and according to some critics he should be regarded as the real inventor of tragedy. He was the first to bring female characters on the stage; for the light satyr plays of his predecessors, he substituted plays on serious subjects taken both from the heroic age and from the history of his own time; and he was the first to introduce an actor distinct from the leader of the chorus, and thus to open the way for the development of the dialogue. In his works, however, the lyrical choruses still retained the principal place, and these are said to have been so celebrated that they were sung even in the time of Aristophanes. Of his plays, the most important were *Φοινίσσαι*, which dealt with the defeat of the Persian invaders (B.C. 480), and is said to have been copied by Æschylus in *The Persians*, and *Μιλήτου ἅλωσις*, on the capture of Miletus by the Persians. According to Herodotus, the Athenians were so moved by the latter tragedy that they fined the poet one thousand drachmas for recalling to them the disasters of their kinsmen, and passed a law forbidding further performances of the piece. Only a few fragments and the titles of nine of his plays are extant. Consult: Nauck, *Tragicorum Græcorum Fragmenta* (Leipzig, 1856).

PHTHIOTIS, thī-ō'tĭs (Lat., from Gk. *Φθιῶτις*). In ancient geography, the southern part of Thessaly, north of Ænis and Malis, and west of the Pagasæan Gulf. The district was famous in the epic as the home of Achilles, and from this region the Æolian colonization of Asia Minor seems to have gone forth. The population, though maintaining a Thessalian element, was considered to be Achæan. The chief cities were Phthiotian Thebes, Larisa, Lamia, Melitæa, and Thaumaci.

PHTHISIS, thī'sĭs. See TUBERCULOSIS.

PHY'COCY'ANIN (from Gk. *φῦκος, phykos*, seaweed + *κυανός, kyanos*, blue). The peculiar pigment, usually bluish-green, of the blue-green algæ. See CYANOPHYCEÆ.

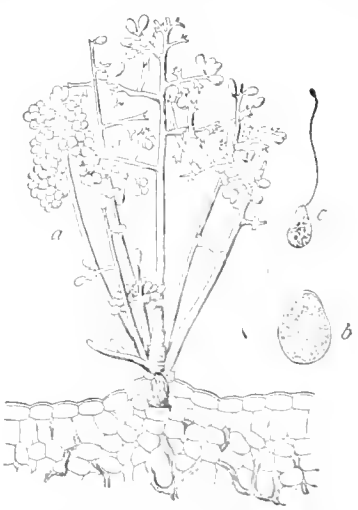
PHYCOERYTHRIN, fī'kō-ĕr'ĭ-thrĭn (from Gk. *φῦκος, phykos*, seaweed + *ἐρυθρός, erythros*, red). The red pigment of the red algæ contained in the chromoplasts, and giving the general tint of the plant body. See RHODOPHYCEÆ.

PHYCOMYCETES, fī'kō-mī-sē'tēz (Neo-Lat. nom. pl., from Gk. *φῦκος, phykos*, seaweed + *μύκης, mykēs*, fungus). A group of plants which comprises, as the name indicates, those fungi most resembling the algæ. (See FUNGI.) The Phycomycetes include the black molds (Mucorales), certain insect parasites (Entomophthorales), the water molds (Saprolegniales), and a group of very important plant parasites included in the order Peronosporales. The simplest of the Phycomycetes are unicellular aquatic forms (Chytridiales) that generally live parasitically in the cells of algæ. These representatives are usually observed in a quiescent condition, in the form of thick-walled spores or resting spore-cases, but there are motile periods in the life history when the organisms swim freely in the water. The Entomophthorales are mostly

WHITE MILDEW (*Albugo Candida*).

a, Oögonium; *b*, antheridium; *c*, oöspore; *d*, swarm-spores escaping from oöspore; *e*, swarm-spores; *f*, conidia; *g*, swarm-spores escaping from conidium; *h*, the same, more distinct.

parasitic on insects, preferring the Diptera and Orthoptera, a common representative (Empusa) being found on the house fly. Late in the summer and in the autumn dead house flies may

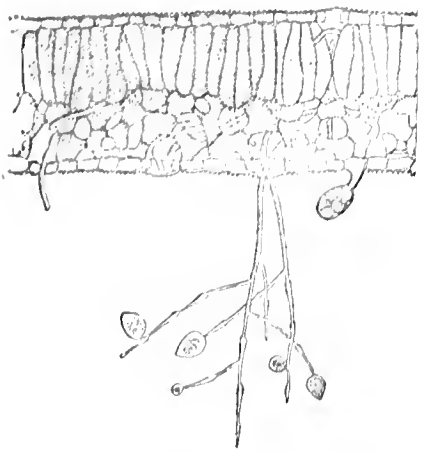


GRAPE MILDEW (*Plasmopara*).

a, The branching sporophores arising from the surface of the host; *b*, a germinating spore; *c*, a swarm-spore.

frequently be observed attached by their proboscæs to window panes, walls, and other sur-

tree, with [illegible] of yellowish powder on the surface around them. This powder is made up [illegible] pore. That have been thrown off from the ends of tubular filaments, which after filling the body of the insect have grown through the segment to the exterior. The large common molds (Mucorales) are frequently called black molds because of the color of the spore cases (sporangia), and to distinguish them from the green and yellow mildews. They are saprophytes, growing upon organic matter in damp places, the bread mold (Mucor) being a familiar example. The vegetative portion of the molds (mycelium) consists of conspicuous threads (hyphæ) plainly visible to the eye, which grow over the sub-



DOWNY MILDEW OF POTATOES (*Phytophthora infestans*). Cross section of leaf showing growth of mildew.

stratum and when possible penetrate it in all directions. The commonest fructification is a black, swollen head (sporangium) containing thousands of spores, and borne at the end of an erect branch (sporangiophore). The Peronosporales are an assemblage of forms, mostly parasitic, and contain some fungi responsible for such serious diseases as the rot of potato and the downy mildews of grapes. (See paragraph *Diseases* under GRAPE and POTATO.) Another troublesome form, sometimes placed among the Peronosporales and sometimes among the Saprolegniales, is Pythium, the fungus responsible for the 'damping off' (q.v.) of seedlings. The water molds (Saprolegniales) have habits widely different from other Phycomycetes, being aquatic and living on dead insects, fish, and frogs, and sometimes on the living animals. They surround the body with a beautiful halo of delicate radiating filaments. These fungi sometimes cause epidemics in fish hatcheries, where they attack the mouths and gills of young trout and salmon. Consult Lindner and Pranti, *Die natürlichen Pflanzenfamilien* (Leipzig, 1887–).

PHYCOPHÆIN (from Gk., *φῦκος, phukos*, seaweed + *φαιός, phaios*, dusky). The brown pigment characteristically present in the cells of the brown algæ. See PHYCOPHYCEÆ.

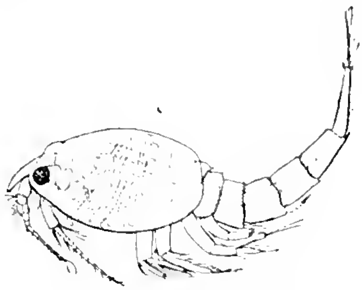
PHYLACTERY (Lat. *phylacterium*, from Gk. *φυλακτήριον, phylakterion*, safeguard, amulet, from *φυλακτήρ, phylaktēr*, sentinel, guard, from *φυλάσσειν, phylassein*, to guard). An amulet or charm worn as a protection against evil influences. In the New Testament the name is given to a strip of fine parchment inscribed with certain passages from the Scripture (Exod. xiii., 1-10; xiii., 11-16; Deut. vi. 4-9; xi., 18-21), and inclosed in a small leathern case. This was, in accordance with a literal interpretation of Exod. xiii. 9-16; Deut. vi. 8, 9, 18, fastened by leathern straps to the forehead, just above and between the eyes, or to the left arm, at the point where the arm, hanging down, falls nearest the heart, or sometimes to the door-post.

PHY'LÆ (Lat. nom. pl., from Gk. *φυλή, phylē*, tribe). In Greek political institutions, the tribes or clans, originally perhaps embracing all the inhabitants of a district, though in many cases there seems to have been a theory of common descent rather than residence. Among the Dorians we regularly find the three tribes, Hylleis, Dymanes, and Pamphyli; at Miletus in Ionia and at Athens we find Geleontes, Argadeis, Ægicoreis, and Hopletes, and these names recur in other Ionian communities. The most important development of the tribe was in the reorganization of the Athenian democracy by Clisthenes after the expulsion of the tyrant Hippias (B.C. 510). The four old tribes were swept away, and the whole people divided into ten tribes on the basis of the demes, in which the people were registered. The demes in each tribe were so selected that the three divisions, Mountain, Coast, and Plain, were all represented. The tribes, which were named from heroes, were Erechtheis, Ægeis, Pandionis, Leontis, Acamantis, Oeneis, Cecropis, Hippothontis, Æantis, Antiochis. The tribes were organized as corporations, and held regularly meetings, apparently at Athens, but not in their own halls. The executive officers were the Epimeletæ, and a treasurer who had charge of the property of the tribes, for as each eponymous hero had priest and sanctuary, and received a certain part of all booty in war, the tribe had to manage certain lands and investments. The tribe chose its representatives on State commissions where work was divided among the tribes, such as the repair of walls, etc. They also elected the rich men whose duty it was to provide the choruses for intertribal competition at the festivals, or other similar public duties laid upon the rich. The military organization was based on the tribal division, for each tribe furnished a regiment of infantry under a taxiarch and a squadron of cavalry under a phylarch. Though the Senate was composed of fifty from each tribe, the senators were not chosen by the tribe but by the demes, among whom they were apportioned on the basis of population.

PHYLARCHUS, fi-lär'kŭs (Lat., from Gk. *Φύλαρχος*) (*c.*210 B.C.-?). A Greek historian. He was born probably at Naucratis, in Egypt, but spent most of his life at Athens. His great work was a history of Greece, embracing the fifty-two years between the invasion of the Peloponnesus by Pyrrhus (B.C. 272) and the death of Cleomenes III., King of Sparta (B.C. 221). His style was graphic and animated, but according to Polybius (ii., 56) he frequently falsified history on account of his passionate admiration for Cleomenes. The work was used by Trogus Pompeius and by Plutarch in his lives of Cleomenes and Aratus. The few extant fragments have been edited in Müller's *Fragmenta Historicorum Græcorum* (Paris, 1868).

PHYL'LIS (Lat., from Gk. Φυλλίς). (1) A Thracian princess, betrothed to Demophoön, the son of Theseus, who left her to go to Athens, promising to return at a certain date. When the appointed time had passed without his arrival, Phyllis killed herself and was changed into an almond tree, which put forth leaves only when Demophoön shortly afterwards returned and embraced it. (2) In pastoral poetry, a name conventionally used of a maiden or lady-love.

PHYLLOCAR'IDA (Neo-Lat., from Gk. φύλλον, *phyllon*, leaf + καρίς, *karis*, shrimp). A highly composite or generalized order of Crustacea, separated by Packard from the Phyllopoda. The group is represented at the present time by Nebalia and its allies (Nebaliidæ) of the North Atlantic, forming the Leptostraca of Claus; also by fossil forms from the Cambrian period to the end of the Carboniferous, some of which were over a foot in length, while Nebalia itself is about half an inch long. In Nebalia the



A PHYLLOCARID (*Nebalia bipes*).

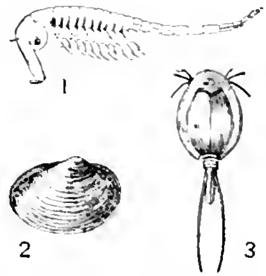
body is compressed and protected in front by a bivalved carapace, closed by a weak adductor muscle, but without a hinge; the rostrum is free, movable; the eyes stalked; the eight pairs of thoracic legs resemble those of phyllopod crustacea, and the hind body is modeled on that of a copepod crustacean such as Cyclops. It undergoes no metamorphosis, and is an example of the persistence of type from very early geological times.

PHYL'LOCLAD (from Gk. φύλλον, *phyllon*, leaf + κλάδος, *klados*, branch), or CLADOPHYLL. A branch that functions as a leaf, which it resembles in form and color. Well known illustrations are the 'leaves' of smilax and asparagus.

PHYL'LODES (from Gk. φυλλώδης, *phyllōdēs*, leaf-like). Leaf petioles which have developed as blade-like organs that replace regular blades. They occur only among dicotyledons. Phyllodes may be distinguished from true leaves by the parallel veining, and also by presenting their edges up and down (profile position). The greatest display of phyllodes is found among the acacias of Australia, where nine-tenths of the numerous species have phyllodes instead of true leaves. The normal blade of these acacias is pinnately compound, as is shown by their seedlings, and occasionally when older growths are subjected to unusual conditions. In the case of pitcher plants (see CARNIVOROUS PLANTS) the urns, tubes, etc., are usually regarded as hollow phyllodes, the true blade being represented by the more or less conspicuous lids.

PHYL'LOGRAP'TUS (Neo-Lat., from Gk. φύλλον, *phyllon*, leaf + γραπτός, *graptos*, written, from γράφειν, *graphein*, to write). A genus of fossil graptolites, index fossils of the Lower Ordovician rocks of North America and Northern Europe. The thecæ, or cells in which the animals lived, are arranged in four rows with their dorsal sides united along a common axis to form a four-bladed colony, the blades of which are at right angles to each other. See GRAPTOLITE.

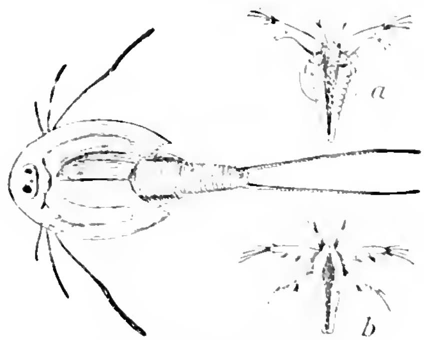
PHYLLOP'ODA (Neo-Lat. nom. pl., from Gk. φύλλον, *phyllon*, leaf + πούς, *pous*, foot). An order of fresh-water Crustacea, in which the legs are broad and leaf-like, subdivided into lobes, and adapted for respiration as well as locomotion. The trunk is not differentiated into a thorax and abdomen. The eyes are usually simple or compound, and either sessile (Apus) or stalked (Branchipus), while there is a median



PHYLLOPOD CRUSTACEANS.

1. *Branchinectis Coloradensis*; 2. Shell of *Estheria Belfragei*; 3. *Lepidurus Couesi*.

simple eye retained from the Nauplius stage. The number of body-segments varies greatly, and the body is usually protected by an ample shell consisting of two valves closed by an adductor muscle. In the group represented by Branchipus and the brine shrimp (Artemia) there is no shell. These crustaceans are very primitive, and apparently are the ancestral forms of the class Crustacea (q.v.), their limbs being much like the parapodia of annelid worms. A Cambrian form (Protocaris) is supposed to be allied to Apus. All the members of this order hatch in the Nauplius stage, and after a series of molts attain the adult form. The phyllopods live in pools liable to dry up in summer. Their eggs are of two kinds, summer and winter, the latter being protected by a dense shell, so that they can dry



PHYLLOPODA AND LARVÆ.

Adult of *Apus æqualis*, and (a) Larva of *Apus cancriformis*. (b) Nauplius of *Artemia salina*.

up and live for months or years, the young hatching when the eggs are moistened by the refilling of the pools or ditches. In some species the males have not yet been found. Consult Packard, *A Monograph of North American Phyllopod Crustacea* (Washington, 1883).

PHYL'LOTAXY (from Gk. *φύλλον, phyllon*, leaf + *τάξις, taxis*, arrangement). Leaf arrangement; that is, the methods in which leaves are disposed upon their axes. See LEAF.

PHYLLOXE'RA (Neo-Lat. nom. pl., from Gk. *φύλλον, phyllon*, leaf + *ξηρός, xēros*, dry). An insect of American origin (*Phylloxera vastatrix*), which belongs to the aphid family, and which, accidentally introduced into France about 1859 upon native American vines, spread through the principal vine districts of Southern Europe, causing enormous damage. It has further spread into Algeria and through Southern Russia into the adjoining countries of Asia. It has also been carried into New Zealand and South Africa, as well as portions of Australia. In the United States it was at first known only in the region of the Rocky Mountains, but was afterwards found in California, where it is confined to those vineyards in which the European vine is grown from its own roots.

The Phylloxera is indigenous to North America, where it has always existed on the wild vines. It occurs in four forms, the leaf-gall form (gallicola), the root form (radicicola), the winged or colonizing form, and the sexual form. The sexual insect lays the winter egg on the old wood. The young one hatching in the spring proceeds to a young leaf and locates itself upon the upper surfaces, gradually forming a gall about itself which projects from the lower side of the leaf. It reaches full growth in fifteen days, and fills its gall with small yellow eggs, from 500 to 600 in number. These eggs hatch in eight days, and the young migrate to all parts of the vine to form new galls. Six or seven generations of these wingless females follow one another through the summer, frequently covering the leaves with galls. At the approach of cold weather the young proceed to the roots, remaining dormant until spring. In the spring the root is attacked by a series of generations of wingless females which produce swellings upon the rootlets. During the late summer and fall some of the root lice give birth to winged females, which escape through the soil and fly to neighboring vines, laying their eggs on the bark. From these eggs the sexual generation issues, and the life cycle is begun again. The root form, however, may proceed in successive broods for a number of years, as is the case with the European vines on which the leaf form rarely occurs. The insect is spread by the flight of the winged females, by the migration of the root-lice through cracks in the soil, and by the carrying of the leaf-gall lice by winds, by birds, and by other insects, and further by the shipping of infested rooted plants or cuttings bearing the winter eggs. The leaf form is especially noticeable upon American vines, and is common upon the wild vines. The root form is rarely seen, but is the cause of the only severe injury to the plant. When occurring plentifully, the death of the vine in a few years is certain. The root lice first produce enlargements on the rootlets, extending their work to the larger roots. The leaves [illegible] and broken and finally die and rot. The vine stops growing, the leaves become sickly and yellowish, and since the Phylloxera disappears from the dead roots, the cause of the death of the plant is frequently obscure. The European vine (*Vitis vinifera*) is particularly subject to the attacks of the root form, while most American vines, although frequently carrying the leaf-galls, are more or less immune to root attacks.

The remedies used for this pest are the subterranean injection of bisulphide of carbon, and the submersion of the roots by inundating vineyards at certain seasons of the year by water. The standard preventive now employed all over the world is the use of American vines as stocks upon which to graft the susceptible European varieties. The immunity of the American vines seems to be due to the thicker bark covering of the roots, and to a greater natural vigor. The chief resistant varieties of American vines are the Æstivalis, the Riparia, and the Labrusca. Some American vines, however, as the Delaware, are almost as susceptible as the European vines. The varieties of the Æstivalis most used are the Herbemont and Cunningham; of the Riparia, the Clinton, Taylor, and Solonis. Consult Marlatt, *Principal Insect Enemies of the Grape* (Washington, 1898).

PHYLOG'ENY (from Gk. *φῦλον, phylon*, tribe + *-γένεια, -geneia*, production, from *γίγνεσθαι, gignesthai*, to become). While ontogeny (q.v.) is a term expressing the development (embryology) of the individual, phylogeny means the development or genetic history of the members of the group or class as a whole. The conception of such a process did not arise until a multitude of facts had been accumulated during the study of the embryology of different animal types, the results being further checked and complemented by the facts of paleontology. The doctrine or theory of phylogeny, then, rests (1) upon a series of life-histories of animals, including their embryonic and post-embryonic stages of development; (2) upon what we know of the geological succession of animal forms; and (3) upon the theory of descent. Phylogeny is the equivalent of genealogy, and involves the idea of blood-relationship. A genealogical tree of a single human family, when carried out through many generations, is almost indefinitely branched and subdivided, the members or descendants from the earliest human pair affording an instance of divergent evolution. The ancestral tree or pedigree of any class of animals is a matter of theory, but the facts of affinity and homology are so numerous and natural that the theory is fairly well grounded. The phylogeny of any group is an expression of one's view of classification, and since in respect to many groups there is a divergence of opinion as to the systematic position of this or that member, so the views as to the pedigree of certain classes or general groups differ with different systematists. The success of the endeavor to work out a phylogeny of any group depends very largely on knowledge of the earlier fossil forms; yet each attempt leads to the more careful study of this or that characteristic, to tracing its growth, development, and final disappearance, or replacement by a later acquired feature, while the mental discipline resulting tends to render the work of the systematist more philosophical. See PALEONTOLOGY; EVOLUTION.

PHY'LUM (Neo-Lat., from Gk. *φῦλον*, tribe). A term given by Haeckel to the primary divisions of the animal and vegetable kingdoms, which has now generally superseded the old terms 'sub-kingdom,' 'branch,' and 'type.' A phylum is a primary group either of animals or plants, all the members of which are supposed to be blood relations descended from one and the same stem, or ancestral, primitive form. The members inherit a mode of development, larval or nepionic stages of post-embryonic development, and adult structures which taken together make them to differ from those of other phyla. See CLASSIFICATION OF ANIMALS; PHYLOGENY.

PHY'SA (Neo-Lat., from Gk. *φύσα*, pair of bellows, breath, bubble). A small pond-snail abounding in quiet fresh waters throughout the warmer parts of the world. It is closely allied to the Limnæa, but the whorls of the amber-

PHYSA.

colored shell revolve from right to left, instead of from left to right as is the rule among spiral shells. A very wide-spread species in the United States is *Physa heterostropha*.

PHYSA'LIA. See PORTUGUESE MAN-OF-WAR.

PHYS'ALIS (Neo-Lat., from Gk. *φυσαλλίς*, *physallis*, plant with husks like bladders, bladder, from *φυσᾶν*, *physan*, to blow, from *φῦσα*, *physa*, bellows, breath, bubble). A genus of annual and perennial herbs and shrubs of the natural order Solanaceæ, remarkable for the calyx, which becomes large and inflated after flowering is over, and incloses the ripened berry. The species are natives of temperate and warm climates, and widely scattered over the world. The common winter cherry (*Physalis Alkekengi*) is a peren-

WINTER CHERRY (*Physalis Alkekengi*).

nial, native of Southern Europe and a great part of Asia, growing in vineyards and bushy places. The berries, which have a sweetish subacid taste, are often eaten. Among the American species, perhaps the following are best known: The downy winter or ground cherry or *Physalis pubescens*, *Physalis Peruviana*, *Physalis Philadelphica*, *Physalis angulata*. Some of these are cultivated in gardens to a small extent. Their fruits make good preserves.

PHYSICAL FORCE PARTY. In British politics, the term frequently applied to the party of Young Ireland which advocated physical force to procure the repeal of the union with Great Britain, after O'Connell in 1843 had countermanded the Clontarf meeting which had already been proclaimed by the military authorities, and on his arrest a week later had issued a manifesto advising the people not "to be tempted to break the peace, but to act peaceably, quietly, and legally."

PHYSICAL GEOGRAPHY. See GEOGRAPHY; PHYSIOGRAPHY.

PHYSICAL OPTICS. See LIGHT.

PHYSICAL SOCIETY, AMERICAN. A learned society organized for the advancement and diffusion of the knowledge of physics. It is one of the affiliated societies meeting with the American Association for the Advancement of Science. It also holds four meetings a year for the reading and discussion of papers upon the subject of physics.

PHYSICAL SOCIETY OF EDINBURGH, ROYAL. A learned organization of Scotland instituted in 1771 and incorporated by royal charter in 1788. Its object is the advancement of physical and natural science, including anthropology, paleontology, and meteorology. Discussions take place at monthly meetings held in the Philosophical Institution, Edinburgh, where the society possesses a large and valuable reference library. The membership is divided into three classes, ordinary fellows, corresponding fellows or non-resident members, and honorary fellows, the number of the last named being limited to fifteen. For over a century the society did not print its transactions, but now publishes an annual volume of *Proceedings*, 16 volumes being issued before 1903.

PHYSICAL SOCIETY OF LONDON, THE. A learned society founded in 1874, with its office and reference library in the Physical Laboratory of the South Kensington Museum, which has since transferred its official headquarters to Burlington House, London. Its object is to promote the advancement and diffusion of a knowledge of physics, and for that purpose to have papers read, new apparatus shown, and experiments tried at its meetings, which it holds fortnightly. The society publishes *Proceedings*, which are issued quarterly, and contain the more important papers read at the meetings, as well as the official records of the society.

PHYSICAL TRAINING (ML. *physicalis*, from Lat. *physicus*, from Gk. *φυσικός*, *physikos*, relating to nature, from *φύσις*, *physis*, nature, from *φύειν*, *phyein*, to produce; connected with Lat. *fio*, I was, Skt. *bhū*, to become, OHG., Ger. *bin*, AS. *bēo*, I am, Eng. *be*). A term in its largest sense including (1) the training of muscles of the body for the acquiring as well as the preservation of health; (2) the employment of the mind as a relaxation from work; (3) the physical exercise of the body as a whole as a means to health and happiness. This does not include training aimed at the enlargement of the muscles alone, which often results in ill health, since most great athletes use up their vitality early in life and die in middle age; nor does it include, except indirectly, the cultivation of certain inherited weak parts of the body, since here again

direct medical advice is the only safe plan to follow.

First of all, certain laws may be laid down. (1) The best exercise is always attained by playing a physical game, as contrasted with gymnasium apparatus, since the game not only stimulates all the functions of the body which otherwise are checked by the sedentary life of most human beings, but it also occupies the mind and thoughts, which, being thus turned away from the cares of life, are restored and refreshed. (2) Such games and exercise should be practiced in the open air, as contrasted with the same practiced within doors, since the air of outdoors is fresher, more stimulating, freer from dust and all substances which, taken into the lungs, do harm. (3) Such exercise should take place in the daytime, as contrasted with the night, since again sunlight has direct physical benefits that are lost when the sun has set. (4) Such exercise should be taken regularly at the same time every day, since a little regular work once a day is better than a large amount once a week, or irregularly.

A game played regularly out of doors in the daytime is therefore the ideal form of physical culture. Yet for a thousand reasons this best form may be impossible. Next best is a game outdoors at night, and after this a game indoors in the daytime. Again, if games are impossible, there are many forms of exercise which can be carried on in the daytime out of doors, and those should be chosen which require the greatest mental attention, in order to rest the mind as much as possible. Next in order would come physical exercise, exclusive of games indoors, and in the daytime, and finally, least important of all, but still infinitely better than nothing, certain physical exercises indoors during the night time. It is manifest at the start that the great body of humanity is confined to this last, but properly carried out it is itself sufficient to preserve health and often to bring back health to those who have lost it.

OUTDOOR EXERCISE.

GAMES. The best exercise in the world is unquestionably obtained in the game of polo. The entire body is at work all the time; every muscle, every nerve, is used constantly; no part of the body is neglected. In addition to this no man can play the game and keep his mind on business; for not only must all the brain he has be devoted constantly to the play, but he has under him another personality—the pony—which requires constant watching and direction. When the game is over the physical body is thoroughly exercised, the mind has been employed to its unbounded relief, and the whole man, physically tired, is renovated as nothing else can renovate him. Polo, however, is very expensive and therefore confined to the few. Next in order of importance would come the game of football, which covers all that has been said of polo, except that there is no other intelligence than that of the individual himself to guide. As in polo, football exercises all parts of the body, occupies the mind, with its absorbing interest in organization, combination—team play as it is called—and with the constant attention required to develop the best results for the individual himself. Again, this game is limited to young men, both because of the time required to practice, and because middle age too often makes the human machine incapable of enduring the physical strain.

Lacrosse comes next in importance. It has many of the good qualities of the two first-mentioned games, and it certainly occupies the mind. But a moment's reflection will show that in lacrosse the legs and leg muscles are developed at the expense of the chest, back, and some abdominal muscles. Lacrosse, however, is also confined to young men as a rule. Lawn tennis is more available for the average man; it has the advantage of being open to women and requires less training, less preparation, fewer players, and a shorter time each day. The expense is much less and its availability is therefore much greater. Again, however, one side of the body is exercised and therefore developed at the expense of the other, which is a serious objection, and also an element is wanting that plays an important part in the games already mentioned. In polo, football, lacrosse, and such games the element of personal contact is a most beneficial factor, even though it adds materially to the danger of the games. When injuries occur they are to be deplored, but they do not destroy the good there is in the games, and the moment the personal contact feature disappears, just so soon does the individual lose all the training in self-reliance, self-control, dignity, forbearance, and courage, which are as important in physical culture as are digestion, good circulation, and normal muscles. The loss of these in such games as lawn tennis is a serious drawback, and yet, following the principles already laid down, lawn tennis is infinitely better than nothing. The game can be played almost three-quarters of the year in the northern half of the United States and all the year round in the southern half. Baseball, considered from the point of view of physical culture, is not equal to any of the games already mentioned. It is first irregular in its muscular development; then, the very nature of the game requires sudden unnatural spurts of exercise with many periods of nerve-straining delays interspersed. Golf is now thoroughly established in this country, and becomes much more available as a means of physical training than any of the games so far mentioned because it is possible and feasible for many men and women. It has not the physical culture that other games have, because it involves no personal contact and because it is slight in its development of muscular tissue. And yet for the present purpose it is very valuable, since men and women of all ages from childhood to old age can play it, and it is available nearly the entire year over the whole of this country. Furthermore, if played regularly, it furnishes a training to the man who could not stand the more vigorous demands of other games.

Ice sports may be compared in merit with lacrosse. They offer the invaluable quality of being available at a time when most outdoor games are impossible on account of weather conditions, and as such they are the winter equivalent of other sports. The open air, the stimulant to circulation, the optimism engendered by the bracing qualities of the wintry out-of-doors are all valuable, but the limited time of their use confines them to the class of substitutes for other forms of physical culture.

In a general way, track sports and rowing cover the other forms of games for out-of-doors,

and both of these should come last in any physical culture category, since they have certain distinctly meretricious elements. Rowing in eight-oared shells, in four-oars, in pairs, in singles involves racing—competition—which, good in other sports, works for evil here. There can be no question that the strain of a boat race of any kind is injurious to the heart and the lungs. In contradistinction to other games, rowing is one continuous strain and effort from start to finish. There is no respite, no temporary delay where for an instant the organs of the body can snatch a little rest. And the same is in a measure true of running of all kinds, while the added disadvantages present in all track sports is manifest in the absence of any personal contact.

Walking, much abused as it is, will do much for health if properly conducted. But walking, as here considered, is different from the employment of 'shank's mare' to conduct a body from one point to another. In the first place, the walk should be taken at the same time each day. The individual should dress for it in light, loose clothing to give the freest possible play to all the muscles. The head should be held up, shoulders well back, chest thrust far forward, and the arms bent a little, while the hands grasp two banana-shaped pieces of cork like the handles of a bicycle. The stride must be long and swinging, starting from the shoulders and including the hips, so that the whole body swings forward on one side and then on the other as each step is taken, and the side and abdominal muscles are kept constantly at work. The pace should be fast and there should always be a definite point to be reached at a definite time. One would say that any human being, no matter how busy he might be, could find time for a half hour's walk during the day or night, and if he would prepare for it in suitable clothing and follow it out as an exercise, and not as a dilatory way of getting an opportunity to think over some problem of business, he would receive material benefit thereby. Its great disadvantage, however, is that even carrying out the stride, the position of the body and the regularity of the exercise, he still secures no rest for his mind, since the mere physical act of walking does not necessarily require constant mental attention. It only requires a problem of life that is sufficiently absorbing to divert the thoughts from surrounding objects or from attention to the operation of walking to the problem itself. In fact, walking often helps the mind to work. Riding has this advantage over walking, that it does give the mind relaxation, since the management of the horse requires a certain amount of attention. But, again, riding has not the amount of physical exercise in it that walking has when the latter is properly carried out, and riding is not as easily undertaken in view of the expense of keeping a horse. In the order of importance as regular outdoor forms of special development exercise come swimming, bicycling, running, shot-putting, hammer-throwing, and so on. They are all good—that is, better than nothing, better than the same things indoors—when properly and regularly carried out; but they all have distinct disadvantages. For example, bicycling develops the legs without doing much for arms or shoulders, and the bicyclist too often leans heavily upon the handle-bars, bending far forward, compressing his lungs, training his shoulders to become 'round,' and forgetting entirely the abdominal muscles that need the regular gentle development of constant movement. Swimming, which is very general in its all-round use of the body, has its distinct advantages. But it can only be undertaken at limited times in the year, and then only by him who lives near the sea or some large body of water. It is questionable for the individual, since there are many people whose circulation is far from being benefited by bathing in the constant manner which is necessary if any physical good is to come of swimming as a regular exercise.

INDOOR EXERCISE.

Sparring is perhaps the best of indoor games. It is a most admirable exercise. It uses all the muscles of all parts of the body. The swaying of the trunk, the quick movements required in all the leg muscles, the extraordinary variety of movements about the arms, neck, back, and head, all keep the muscles in good condition and stimulate circulation, respiration, and good digestion. But in addition to this it can be seen that no one who is boxing can give much thought or attention to his business, or to anything but the game in hand. It needs only a straight blow on the nose to wake up the delinquent and make him give his undivided attention to the matter in hand. Here is a game that in many ways surpasses bicycling as a means to physical culture, while bicycling, on the other hand, has the one advantage of taking the individual out of doors. Wrestling has many of the good points of sparring and as such is a good form of physical culture. Yet here the teacher is more necessary than in most games. The danger of straining muscles and weakening tendons is very great, since a contest is of course necessary, and the desire for victory prevents one or the other of the combatants from giving up when a strain becomes the penalty for not doing so. Yet both these games develop all parts of the body equally and thoroughly.

Rackets, court tennis, and handball are all capital indoor games. They employ the mind and can be undertaken for half an hour a day regularly at a certain time. The disadvantage in them over such exercises as sparring is that they develop one side of the body to the detriment of the other. A right-handed player, for example, is constantly using his right arm with the racquet, and thus develops his whole right side without bringing the left side into play to any great extent. Naturally the circulation, the respiration, and the general relaxation of both mind and body go on, but the muscular development needs some specific exercise for the left side after the game is over, if the normal of physical culture is to be attained.

Fencing also has the same one-sided development, yet it adds the ease and grace of movement which make it one of the most valuable means of physical culture for women that can be used under cover of a roof. Like single stick and the many forms of offense and defense with a weapon, it really has qualities that few games can boast. The agility, quickness, grace, and *finesse* that are required have to do with physical culture in its highest sense.

SPECIAL DEVELOPMENT EXERCISES.

To go thoroughly into this large branch of physical culture would be impossible here. It is possible, however, to suggest lines of work. The pulley-weights and dumb-bells are so monoto-

nous that they do not occupy the mind, and they therefore lose a part of their force as means toward physical culture. The punching bag, on the other hand, is really a game which is played with an inanimate but very vigorous adversary. Again, however, it is necessary to add, in order to preserve a proper sense of proportion, that this is not equal to a game out of doors in the daytime and never will be; but then, on the other hand, it is so much better than nothing that it often means in so many words the difference between health and sickness. In like manner might be catalogued the apparatus of the gymnasium in the order of their desirability, such as rowing machines, parallel bars, pulley-weights, and so on. They all have their uses; they can all be set up in any private house, and they are all of service in maintaining health when nothing better can be had. Their use is precisely and only this: Exercise must be taken regularly every day in some form to stimulate circulation and respiration; exercise must be given the mind along other lines than those followed in daily life. Either the home or the club gymnasium will be better than nothing, as a little regular exercise day by day of whatever kind is better than none at all. One other method offers itself for general consideration and that, too, is better than nothing. Yet it requires what is found only here and there in mankind—the capacity for absolute regularity day by day, every day of every year. There seems to be something in the human make-up that militates against regularity, and in the least beneficial and yet easiest of forms of physical culture regularity is the whole story. Forms of exercise without the use of apparatus are best suggested by the United States Army *setting-up exercises*. They include the *Swedish system*, the *Delsarte system*, and all the other innumerable forms of setting-up exercises which have been invented. In considering these, two very different points of view must be considered. (1) If a portion of the body is weaker than all other portions—for example, if a broken leg, now healed, needs special attention to bring the long unused muscles up to standard—these forms of exercise ought to be taken under the advice of a physical culture instructor, since a thorough knowledge of anatomy is needed to point out just what exercises are most efficacious. (2) If the maintenance of general health is desired, then no teacher or instructor is at all necessary. It only needs to consider the muscles of the body. For example, before bathing, lie on the floor on your back and (1) rise to a sitting position twenty times; (2) raise the legs to a perpendicular position twenty times; (3) turn over, and, touching only the toes and hands to the floor, thrust the body upward by straightening the arms twenty times; (4) stand up, and, keeping the legs straight, bend forward and touch the finger tips to the floor twenty times; (5) rise on the toes twenty times; (6) keeping the body straight and upright, bend the knees and sink down toward the floor twenty times, rising again by straightening the legs; (7) take hold with one hand of the end of a door and grasp with the other the door frame when the door itself has been opened about one-quarter of a quadrant; standing thus, allow the body to fall forward so that the chest passes through the opening and the shoulders are thrust far back until the shoulder-blades touch; do this twenty times; (8) place the hands on the hips, stand straight, and then bend forward as far as possible twenty times, backward twenty times, to the right side twenty times, to the left twenty times; (9) standing straight, go through—twenty times each—the motions of raising the arms at full length above the head, backward, forward, and down. When a child or youth or a young girl is in question the advice of an expert is, of course, almost necessary.

GENERAL CONSIDERATIONS.

In conclusion it is necessary to suggest a few general rules which apply to all forms of exercise for physical training. Food is the principal question. Eat three times a day and always at the same hours. Eat simple meats and vegetables, a light breakfast, a moderately light lunch or midday meal, and a moderately heavy evening meal. Never eat at any other time. By simple foods is meant meat and vegetables cooked simply without sauces and extra substances which only confuse the digestive organs when they begin their wonderful work of turning food into blood and tissue. Drink plenty of water between meals, but little or none at meals. Drink alcoholic drinks or not as you like, or as your belief dictates; but remember that temperance is neither too much nor too little, and the actual amount per day which is really temperate must in each case be decided by the individual. There have been men who drank temperately all their lives and lived to be ninety and the quantity per day which they consumed would have killed another man in a year. Temperance is the only rule, and as what is temperate for one is intemperate for another, each must decide for himself. Clothing has much to do with physical culture. In parts of the United States the climatic changes are great, but it should be remembered that our houses are of about the same temperature all the year round. Therefore the underclothing should be of the same thickness all the year round and the outer clothing should fit the outer climate of the day. But more important perhaps than this is the rule that underclothes should be changed once every day. After the regular occupation of the day, just before dinner or supper, say at six or seven o'clock, every man and woman should put on a clean set of underclothing. The physical benefit is immense, but it does not compare with the mental rest and recreation that will result from this simple aid of physical culture. Bathing is another necessity. Each man and woman immediately after rising and taking fifteen minutes of exercise, should take a shower bath of first warm and then cold water, or if a shower is impossible, an ordinary bath in a tub. Never neglect the final cold water. It closes the pores of the skin and avoids the danger of taking cold. The feet are perhaps as important as anything. Napoleon said that an army with good shoes could do anything he asked of it. So might a man say that his body will do anything he asks of it if his feet are well cared for. Buy good shoes, and take care that they are not too large, and are well made. Keep them carefully and change them at least once a day in the early evening. Have several pairs so that the shoes can have a rest every other day. Finally *regularity* in sleeping, eating, dressing, and exercising is the important detail. Such are the extraordinary powers of the human body that it responds to regularity, to habit, as to nothing else. It be-

comes accustomed to certain things at certain times and it will serve you better than you serve it, if you will but treat it temperately, regularly, and generously. If you sleep regularly, eat regularly, dress regularly, exercise regularly, you can put your physical and mental body to such strain in the way of work as would kill the irregular man in a few months—and that is after all the substance of all physical culture.

BIBLIOGRAPHY. Frobisher, *The Blood and Breath: a System of Exercise for the Lungs and Limbs* (New York, 1876); Brendicke, *Grundriss zur Geschichte der Leibesübungen* (Göthen, 1882); Hoole, *Science and Art of Training* (London, 1888); La Grange, *The Physiology of Bodily Exercise* (ib., 1889); Schreber, *Aerztliche Gymnastik* (23d ed., Leipzig, 1889); Jenkin, *Gymnastics* (New York, 1890); Lewis, *Home Gymnastics* (ib., 1892); Bissell, *Physical Development and Exercises for Women* (ib., 1891); Stebbins, *Dynamic Breathing and Harmonic Gymnastics* (ib., 1893); Treves, *Physical Education* (London, 1893); Sandow, *Physical Training* (New York, 1894); Hartwell, *Physical Training in American Colleges and Universities* (Washington, 1896); Gissen, *Rational Home Gymnastics for the 'Well' and the 'Sick'* (Boston, 1898); Wide, *Handbook of Medical Gymnastics* (London, 1899); Hough, *A Review of Swedish Gymnastics* (Boston, 1899); Blaikie, *How to Get Strong and How to Stay So* (new ed., New York, 1898); Demeny, *Les bases scientifiques de l'éducation physique* (Paris, 1902); Leonard, "A Select Bibliography of the History of Physical Training," in *American Physical Education Review*, vol. vii. (Brooklyn, 1902).

PHYSICIAN (OF. *physicien, fisicien*, from Lat. *physicus*, from Gk. *φυσικός, physikos*, natural philosopher, physician, from *φύσις, physis*, nature, from *φύειν, phyein*, to produce). In law, one who has complied with all State regulations in regard to the study of medicine, and who may lawfully practice medicine. Most States require a medical student to pass a State examination satisfactorily, and thereupon grant a license to practice to successful candidates. Such provisions are constitutional. A person who holds himself out as a physician is considered to represent that he has the ordinary skill of one of his profession. Lack of skill or negligence on the part of a physician, resulting in injury to a patient, is called malpractice (q.v.). It is generally held to be optional with a physician as to whether or not he will attend a person calling him.

The relation of a physician and patient is a confidential one, and the former is bound not to divulge any of the secrets confided to him by the patient, even on the witness stand. The statutes of each State in regard to the practice of medicine should be consulted. See MALPRACTICE; EVIDENCE.

PHYSICK, fiz'ik, PHILIP SYNG (1768-1837). An American physician, born in Philadelphia, educated at the Friends' Academy. In 1788 he went to Europe, studied with John Hunter, and was admitted to Saint George's Hospital in 1790. In the same year he received a diploma from the Royal College of Surgeons, and assisted Dr. Hunter for one year. Returning to Philadelphia in 1793, he was appointed physician to the yellow-fever hospital at Bush Hill; in 1794 surgeon to the Pennsylvania Hospital; and the following year, on the recurrence of the yellow-fever epidemic, he was placed once more in charge of the Bush Hill Hospital. In 1801-16 he was surgeon to the Philadelphia Almshouse Infirmary; in 1805 professor of surgery in the University of Pennsylvania; in 1819 called to the chair of anatomy, which he filled until 1831; in 1821 consulting surgeon to the institution for the blind; in 1824 president of the Philadelphia Medical Society. In 1825 he became a member of the Royal Academy of Medicine in France, and in 1836 honorary fellow of the Royal Medical and Chirurgical Society of London. He was the author of *Deapoplexia* (1792).

PHYSIC-NUT (*Jatropha*). A genus of about 70 species of tropical shrubs and trees of the natural order Euphorbiaceæ, characterized by alternate, stalked, angled, or lobed leaves, corymbs of flowers on long stalks, and the acrid oil of their seeds. The common physic-nut (*Jatropha Curcas*) of the East Indies, introduced into the West Indies, southern Florida, and other warm parts of the world, is a small, much branched, rapidly growing tree or bush with a milky juice. It is used for fences in many tropical countries. The expressed oil, commonly called jatropha oil, is used for illuminating purposes, and has been used in medicine. The French or Spanish physic-nut (*Jatropha multifida*), an American shrub with many-lobed leaves, yields an acrid oil, called oil of pinhoen. To this

PHYSIC-NUT.

genus belongs the pinoncillo (*Jatropha lobata*) of Peru, the roasted seed of which is an agreeably flavored food. Incisions in the stem of this tree allow the escape of a clear bright powerfully caustic liquid which after some time becomes black and horny, but retains this property for years. Physic-nettle (*Jatropha urens*), a native of the Southern United States, has similar qualities.

PHYSICS (from Gk. *φυσικά, physika*, nom. pl. neu. of *φυσικός, physikos*, relating to nature). Physics is one of the successors of the study formerly called natural philosophy, or the science of the phenomena of nature as revealed to us by our senses and as interpreted and systematized

by our intellects. The name itself is the plural of the word 'physic,' which was used as early as the fourteenth century to mean natural philosophy, but which afterwards became restricted to mean the science of medicine, and finally to mean a medicine or drug itself. While physics in its modern sense comes closely in contact with chemistry, astronomy, and many other sciences, it is impossible to state in words its exact scope. It may be said, however, in general that the study of physics includes the phenomena of acoustics, of heat, of light, of electricity and magnetism, and of mechanics to a certain extent. Within recent years many subdivisions have been made both in physics as a general study and also in its various parts. The subjects pertaining to the nature of solutions are now included in physical chemistry; the spectroscopic examination of the sun, stars, etc., together with the related theories, forms the science of astrophysics; the observations and theories of earthquakes, heat conduction on a large scale, volcanoes, etc., are now studied under the name of geological physics. Practical applications have been made of many observations in physics, and there are schools of engineering devoted to the study of these matters. Among the branches of engineering are mechanical, hydraulic, steam, and electrical.

The fundamental idea of physics is that we learn by means of our senses certain facts in regard to natural phenomena, which are independent of time and space. These last two concepts, namely those of time and space, are considered as intuitive. The name matter is given provisionally to whatever is the cause of our sensations; but it is *defined*, naturally, in terms of its properties. There is not necessarily involved any assumption as to the reality of matter; rather, there are found certain mathematical expressions, certain differential equations, which express our knowledge of nature, but which we interpret in such language and with such ideas as correspond to our mental pictures. Associated with this idea there are two great divisions of physical methods; one may be called the laboratory method, the other the method of mathematical physics. (See LABORATORY.) The laboratory method consists, first, in making a series of observations and amassing information in regard to phenomena, but further in seeking to obtain a generalization with which the observed phenomena may be in accord. The object and scope of mathematical physics is well expressed by Professor Poincaré in his introduction to the *Reports of the International Congress of Physics* (Paris, 1900). The fundamental method is to devise certain postulates and to state such axioms as will lead by rigid mathematical processes to formulæ which may be compared with observed phenomena. Thus by means of the methods of logic conclusions may be drawn connecting many phenomena which on their face are unrelated.

HISTORY OF PHYSICS. It is remarkable to note how few facts other than obvious ones were known to the ancients in regard to nature, and also to find how few instruments were available for what may be called scientific observation. Beyond a doubt simple forms of instruments were known for the measurement of time, such as water-clocks, sun-dials, etc., and the Chinese at least had a knowledge of some of the simple properties of a magnet. The law of the reflection of light was generally known and lenses were in use for various purposes. The law of the lever was known to Archimedes, as were also certain of the laws of hydrostatics. There was a knowledge of harmony in music more or less incomplete. A few observations are also noted in regard to electric attraction and the facts of meteorology.

Up to the Middle Ages there are few if any facts to be recorded in regard to the growth of natural philosophy, because the Romans were content with the knowledge left them by the Greeks, and the intellectual activity of the Arabs seemed to be concentrated, as far as physics is concerned, in the person of Al-Hazen, who was interested largely in optics. There was a revival of interest in nature during the thirteenth century, as shown by the work of Roger Bacon and Peregrinus. In the sixteenth century Copernicus lived, and he was followed by Galileo, Kepler, Stevin, Gilbert, and others.

The effect of the life and work of Galileo in Italy and of Gilbert in England cannot be overestimated. There was a universal revival of intellectual activity and a universal interest in the study of natural phenomena. Each of these two men emphasized the need of experimental study and the futility of logic apart from observation. Galileo's greatest contribution to physics was the statement of the principles of mechanics. He was succeeded by pupils whose interest and influence was so great that they led to the establishment of academies and learned societies throughout Europe. With the appearance, however, of Huygens's *Horologium Oscillatorium* (1673) and Newton's *Principia* (1687) physics came to the front as the most important of the sciences. The methods used by these two men, both in their observations and in their statement of laws of nature, have served as the models for succeeding generations. They were followed by two schools, one interested in the mathematical development of mechanics, the other interested in the purely experimental side of the subject, whose legitimate predecessors were Torricelli, Pascal, Boyle, and Guericke.

MODERN TIMES. The development of our present knowledge of physics is more fully described under the separate headings of its various subjects; namely, acoustics, heat, light, electricity, and magnetism. It should be sufficient in this place to refer to a few names in connection with each of the subjects. Our accepted ideas in regard to the nature of heat and heat effects are due to the researches and theories of Black, Rumford, Davy, Carnot, Clausius, and Joule. In light we owe most to Young, Fresnel, Fraunhofer, Kirchhoff, and Stokes. In the subjects of electricity and magnetism a long list of names should be mentioned, but among these those of Volta, Cavendish, Ampère, Oersted, Faraday, Henry, Gauss, Weber, Maxwell, and Hertz are easily the most notable. To Helmholtz alone, it is only fair to say, all of our accepted ideas of the theory of sound are due. The names of no living men have been included in the above summary, but any such list would be incomplete without the addition of the names of Kelvin, Rayleigh, Lorenz, J. J. Thomson, and Röntgen, who have contributed so much to the most recent ideas in regard to the fundamental concepts of nature.

Previous to the nineteenth century there were

three great principles of physics which were firmly established and which deserve to be called laws of nature. These were the law of gravitation, the principle of the conservation of matter, and that of the conservation of momentum. Some doubts have recently arisen as to whether the weight of a definite quantity of matter remains unchanged as its state is altered, but there seems to be no reason for doubting the principle of the conservation of matter itself. The most notable fact in the history of physics during the nineteenth century was the development of the principle of the conservation of energy and its application to all fields of science. This great development was due largely to the efforts of J. R. Mayer, Helmholtz, and Joule. Other great principles, such as the second law of thermodynamics, were expressed in words, and will be found discussed in other places. The kinetic theory of matter was also elaborated and established on a firm basis.

Beginning with the discovery of the X rays by Röntgen in 1895 and of the radiation from uranium by H. Becquerel in 1896, there has been a progress in physics and in our knowledge of the properties of matter which has been one of the most striking facts in the whole history of science. The point of departure in our new knowledge comes from the epoch-making discovery by J. J. Thomson that in their passage through air both the X rays and those from uranium make the air a conductor for electric currents. This discovery led at once to investigations by observers the world over in regard to the nature of the ionization of air and of the radiations which produce it. It was soon found that many substances other than uranium had this same power of emitting radiations which would ionize a gas; such were thorium, and the newly discovered elements, radium and polonium. These substances are said to be 'radioactive;' and it was observed that nearly every body in nature was 'active' to a greater or less degree. The properties of the radiations themselves were carefully studied and analyzed, and their properties other than that of ionization were investigated. There are always present in the radiations from such bodies both positively and negatively charged particles of matter whose velocities vary within wide limits. When the velocities of the negatively charged particles as produced in various ways were studied, a most remarkable fact was observed. Attention had been called many years ago by J. J. Thomson to the fact that if a charged sphere were moving rapidly it would have an effective inertia greater than that which would be observed in case it were uncharged. In other words, an electrical charge in motion has an apparent mass quite apart from that of the matter carrying it; and formulas have been deduced by Thomson, Heaviside, and Abraham connecting this mass of the charge with the quantity of charge, its velocity, and its acceleration. It was observed in the case of the negatively charged radiations above referred to that their apparent mass was exactly that which would be calculated from the formulæ on the assumption that the mass was due entirely to the moving charge. This discovery renewed at once the theories of matter which had been advanced before, in accordance with which the inertia of matter is a property due to the motion of an electric charge. The name 'electron' has been given these charges when considered apart from matter, and a most interesting discussion of their properties and of the theories of matter based upon these is given in a series of papers by Sir Oliver Lodge in the *Electrician* (London) during the winter of 1902-03.

One of the great contributions of the nineteenth century to physics was the development of the idea of the luminiferous ether. The necessity of a medium for the transmission of the waves which produce the sensation of light had been recognized for many years and was clearly stated by Fresnel and others. Faraday had also come to the conclusion that a medium was necessary for the transmission, or rather existence, of electric and magnetic forces, and had suggested that possibly this medium might be identical with the one that carried 'light waves.' Maxwell showed by theoretical considerations that the velocity with which an electromagnetic disturbance would be propagated in the medium referred to by Faraday must be numerically equal to the so-called 'ratio of the electrical units,' and further showed from experimental evidence that this was equal to the number expressing the velocity of light. He also proved by a mathematical investigation that the electromagnetic waves were identical in all respects with those with which we are familiar in the phenomena of light, and thus established the fact that only one medium is necessary for the explanation of the phenomena of light, electricity, and magnetism. The connection between this ether and ordinary matter has been investigated by many observers, as described in the article on ETHER. The accepted theory at the present time is that the ether does not move as material bodies are carried through it; and this, in connection with the ideas of electrons, has been elaborated by Lorentz into a theory which is able to explain in the most satisfactory manner the phenomena of dispersion, metallic reflection, and stellar aberration. There are many difficulties, however, which still remain to be investigated in regard to the properties of the ether, in spite of the great progress marking the beginning of the twentieth century. If the inertia of matter is to be regarded as capable of explanation, as indicated above, from the standpoint of electricity, there still remain two great problems for solution. What is the nature of an electric charge? and what is the cause of gravitation? The development of physics at the present time is tending toward investigations of these two questions.

BIBLIOGRAPHY. *General Works:* Winkelmann, *Handbuch der Physik* (Breslau, 1891-96); Daniell, *Principles of Physics* (London and New York, 1894); Chwolson, *Lehrbuch der Physik* (Brunswick, 1902 et seq.); Müller-Pouillet, *Lehrbuch der Physik und Meteorologie* (9th ed., Brunswick, 1902 et seq.); Ames, *Theory of Physics* (New York, 1897); Jamin, *Cours de physique* (Paris, 1896); Poynting and Thomson, *Text-Book of Physics* (London, 1899); Watson, *Text-Book of Physics* (ib., 1896).

Periodicals: *Annalen der Physik* (Leipzig, 1877 et seq.); London, Edinburgh, and Dublin *Philosophical Magazine* (London, 1832 et seq.); *Journal de physique* (Paris, 1872 et seq.); *Physikalische Zeitschrift* (Leipzig, 1899 et seq.); *Zeitschrift für Instrumentenkunde* (Berlin, 1881 et seq.); *Astrophysical Journal* (Chicago, 1895 et seq.); *Physical Review* (New

York, 1895 et seq.); *Zeitschrift für physikalische Chemie* (Leipzig, 1887 et seq.); *American Journal of Science* (New Haven, 1818 et seq.).

History. — Caponi, *A History of Physics* (New York, 1899); Whewell, *History of the Inductive Sciences* (3d ed., London, 1857).

PHYSIOCRATS (from Gk. *φύσις, physis*, nature + *κρατεῖν, kratein*, to rule). A French school of political and economic philosophers, known to their own generation as *Les Economistes*, who wrote against the antiquated methods of the State in encouraging industry (see COLBERT), and in favor of agriculture, industrial freedom and natural liberty. The school flourished from 1756 to 1776. The founder and leader of the school was François Quesnay (q.v.), a noted surgeon, metaphysician, and, after 1749, physician to Madame de Pompadour. With Quesnay is often associated in the founding of the sect the name of Jacques Claude Marie Vincent de Gournay (q.v.), who did not, however, indorse the extreme views of the school respecting the paramount economic importance of agriculture. The most earnest disciples and indefatigable propagators of the Physiocratic doctrine were the elder Mirabeau, Mercier de la Rivière (1720-94), and Dupont de Nemours (q.v.), editor of the works of Quesnay and Turgot and of the Physiocratic journals. Among the statesmen, rulers, and princes of the time who accepted the main doctrines of the Physiocrats were first and most important, Turgot (q.v.), Minister of Finance under Louis XVI.; Charles Frederick, Margrave of Baden; Gustavus III. of Sweden; Leopold II., Grand Duke of Tuscany, and afterwards German Emperor; Stanislas of Poland; the Emperor Joseph II.; and Charles III. of Spain. With some of them the acceptance was little more than half-hearted, and the only monarch who made an earnest attempt to carry out their programme of reform was Charles Frederick of Baden. He tried to apply their principles in three villages, but finally abandoned the attempt.

The general doctrine of the Physiocrats was an extension to the economic sphere of the theory of natural liberty which Locke, Hutcheson, Shaftesbury, and others had applied to the sphere of politics and religion; but, unlike the British philosophers, the Physiocrats denied that the natural rights of the individual could be abridged by any social contract. Every man, they held, has a right to the free exercise of his faculties, so long as he does not infringe the like liberty of others, and this involves the further right to the undisturbed enjoyment of the property which results from the exercise of his faculties in productive labor. It follows from these rights that the sole function of government is to protect life and property and to administer justice, and no interference by the government with commerce and industry is permissible—in the classic phrase of the school, *laissez faire, laissez passer* (q.v.)—but within the restricted sphere noted above the Physiocrats advocated a strong monarchical government, a "legal despotism, tempered only by an enlightened public opinion."

The peculiar economic views of the Physiocrats seem to rest upon a confusion of wealth with material objects, leading to the conclusions that agriculture alone yields a surplus product—*produit net*—above the expenses of production; while manufactures and commerce, which merely change the form or position of raw materials, are barren. As agriculture is the only form of production yielding a value in excess of the cost of production, they advocated that taxes should be levied upon rent—which expresses or measures the 'net product'—so as to avoid the expense and friction attendant upon the shifting of the tax to this source when placed originally upon other objects. They thus gave to political economy the fruitful theories of surplus value and the single tax—*impôt unique*. (See POLITICAL ECONOMY.) The scientific virtues and defects of the Physiocrats may be traced to one and the same cause, the belief in a beneficent and absolute natural law governing the moral and social universe with the same rigidity and precision as the material universe is governed by physical law. This belief made them at once narrow but precise, systematic but unmindful of the difference between physical and psychical phenomena, careful in definition, distinction, and classification, but careless of the effects of customs, law, and the diversity of human motives. They have exercised a deep and lasting influence upon political economy, and it is now usually admitted that Quesnay, rather than Adam Smith, is to be regarded as the 'father of political economy.' Opinions differ regarding their influence upon the practical affairs of the day. They undoubtedly stimulated the study of agriculture, suggested several important agricultural improvements, called attention to the oppression of the peasantry and elevated their importance in the eyes of the nation, and secured a freer intercourse of trade—particularly in breadstuffs—within the French kingdom. In the early years of the French Revolution their doctrines exercised an appreciable effect upon the Constituent Assembly, but their most striking practical influence was exercised through Turgot (q.v.), who, while not a professed Physiocrat, made many earnest attempts, both as intendant of Limoges (1761-74) and as Comptroller-General of Finance (1774-76), to abolish the corvées and the guilds, to introduce free trade in corn, to reduce taxation, and to accomplish the general reforms which the Physiocrats demanded.

Among the most important publications of the Physiocrats are Quesnay's articles on *Fermiers* and *Grains*, published in the *Encyclopédie* of Diderot and D'Alembert; *Le droit naturel*, published with other of his writings in the *Physiocratie* (which gave the school its name), edited by Dupont de Nemours, and his *Tableau économique*, 1758, "the Bible of the Physiocrats," reprinted for the British Economic Association, London, 1894; Mirabeau's *Théorie de l'impôt*, 1760, and *Philosophie rurale*, 1763; Dupont de Nemours's *De l'origine et de progrès d'une science nouvelle*, 1767, published in his *Physiocratie;* Mercier de la Rivière's *L'Ordre naturel et essentiel des sociétés politiques*, 1767; and Turgot's *Réflexions sur la formation et la distribution des richesses*, 1770.

BIBLIOGRAPHY. Oncken, *Œuvres de Quesnay* (Frankfort, 1888); Hasbach, *Die allgemeinen philosophischen Grundlagen der von François Quesnay und Adam Smith begründeten politischen Oekonomie* (Leipzig, 1890); Higgs, *The Physiocrats* (London, 1897).

PHYSIOGNOMY (OF. *physiognomie, phisenomie*, Fr. *physionomie*, from Gk. *φυσιογνωμία,*

physiognōmia, *φυσιογνωμονια*, *physiognōmonia*, art of judging by the features, from *φυσιογνώμων*, *physiognōmōn*, one who judges by the features, from *φύσις*, *physis*, nature + *γνώμων*, *gnōmōn*, judge, from *γιγνώσκειν*, *gignōskein*, to know; ultimately connected with Eng. *know*). In general, the form and expression of the visage or face, especially when regarded as indicative of character; specifically, an art or system of reading character from the face. This system was framed by Lavater, and is related to that of phrenology as formulated by Gall and Spurzheim; it was extended and expanded in America chiefly by S. R. Wells in connection with O. S. Fowler, L. N. Fowler, and others. In its application the system involved temperament as determined from complexion, etc.; the general aspect of head and face, sometimes in comparison with those of animals whose traits the individuals were considered to imitate; the form, size, and prominence of particular features, etc. The chief bases of the system were assumed (1) localizations of functions in the brain, and (2) corresponding localizations in the external features. Later researches in cerebral and general anatomy and physiology have failed to establish most of the assumed localizations and correspondences, while modern students commonly regard facial forms and features rather as hereditary ethnic characters than indices of individual disposition; so that the current art may be defined as character-reading from facial expression. A good many modern students, among whom Cesare Lombroso may be regarded as the leader, distinguish between normal and abnormal types of physiognomy, and view the latter as indices of either degeneracy or reversion to lower ancestral types; and some writers have sought to combine certain classes of abnormalities in a 'criminal type' for the guidance of students, jurists, and statesmen. The recognized abnormalities include certain malformations of face and head, asymmetry of features sometimes analogous to that accompanying epilepsy or paralysis, excess or deficiency of hair and beard, unusual pigmentation, and various stigmata, either congenital or of later development. The coördination of these abnormalities with conduct forms a considerable part of the foundation for criminology (q.v.) as defined by Lombroso. The general form and expression of the visage are among the ethnic traits recognized in defining races and peoples. The facial angle, i.e. the degree of prognathism, is among the most useful measures both in comparative anatomy and in ethnology; the shape of the jaw, the conformation of the cheek-bones, the position of the ocular orbits, the number and character of the teeth, and the nature of the dermal appendages (hair, beard, brows, etc.) are also of primary importance as ethnic characters; while the superior expressiveness of the features of more advanced peoples is among the characteristics noted by the ethnologist.

PHYSIOG'RAPHY (from Gk. *φύσις*, *physis*, nature + *-γραφία*, *-graphia*, description, from *γράφειν*, *graphein*, to write). There is much difference in the usage of the term physiography. It is employed as a synonym for the older term physical geography; as a term to include a general introduction to science; for the study of the physical environment of life; and for the study of land forms alone, that is as a synonym for the recently proposed name geomorphology. In the United States the term physiography is rapidly coming to replace the older term physical geography, at the same time that a more scientific basis is being introduced into physical geography. In this sense, physiography is concerned with the study of air, ocean, and land, with the object of understanding their present condition and influence on life. To understand present conditions leads back into meteorology, oceanography, and geology; to appreciate their influence on life presupposes knowledge of history and biology at least. It is no uncommon belief that physiography is too complex, and drawing upon too many other subjects to have distinct boundaries, and hence to deserve the name science. It is true that there is no general agreement as to the exact boundaries; but this is by no means proof that physiography can have no boundary. Some one has said that geology is a study of the past. That is to say, a geologist, to appreciate his subject fully, must have knowledge as a physiographer; and a physiographer must know the past that he may use geology as a tool in his attempt to understand the present.

Astronomical Aspects. The study of physiography deals essentially with the earth—its spherical form, its envelopes of air and water, its cold crust and heated interior, and their influence on life. Yet no thorough appreciation of these conditons and influences is possible without a general knowledge of the astronomical relations of the earth. The earth as a sphere, and as a member of the solar system in which it so moves as to give day and night and the seasons, are facts of fundamental importance to an understanding of changes in the earth; and the spherical form of the earth, and the presence of heat among the members of the solar system, furnish adequate reason for a consideration of the hypotheses for the origin of the earth. This does not mean that the subject encroaches on astronomy; it is dealing with the earth, but it inquires of astronomy the reasons for terrestrial phenomena of vital importance, and applies these to an interpretation of the phenomena in their relation to life.

The Air. The influence of the air on life is universal. Its oxygen and carbon dioxide; the influence of its pressure; the effects of its density, for example, on the flight of birds; its water vapor; its winds and their effects—these are among the many reasons why a study of the air properly forms a part of physiography. The science of meteorology furnishes the explanations, and with these the physiographer needs to be familiar. In order that he may understand the distribution of life he should know why there is vapor, why winds blow as they do, why there are rainy and desert regions, and why there are storms. The branch of physiography that deals especially with this phase of the subject is climatology. If the climatologist studies only the causes of climate he becomes a meteorologist; but if his especial concern is the understanding of the laws of climate with reference to their influence on life, he is a physiographer. The study of the air has a bearing on other phases of physiography. Waves and ocean currents depend on air conditions, and to understand them calls for a knowledge of air movements. Rain, river floods, the difference between the topography of arid and moist lands, and the existence of glaciers, are among the fea-

tures of the land that depend upon a knowledge of the air for their proper appreciation. Each of these reacts on life. Thus, along several lines, it is evident that there is a phase of air study, calling for an appreciation of the science of meteorology, it is true, but with its main object the investigation of the influence of the air on the environment of plant, animal, and human life.

THE OCEAN. The temperature and movements of the ocean, dependent upon sun's heat and air movements; the tides, dependent on the attraction of the sun and moon; the composition of the ocean water, its depth, and the characteristics of the ocean bottom are among the important physiographic features of the ocean. Each of these has an influence on life. The ocean supplies vapor to the air; its vast expanse and its currents influence the temperature of the air and aid in those movements of the air by which the temperature and rainfall of the lands are profoundly affected. Life in the ocean as influenced by its environment; the effect of ocean influence on the life of the lands; the ocean as a barrier to the spread of life; and its importance to man in commerce and many other ways are among the subjects with which a physiographic study of the ocean is concerned. The oceans and the lands are profoundly interrelated. The waste of the land is carried to the sea by rain and rivers; and the oceanic agents are attacking the land along its border, forming many varied coast features. Changes in level of the crust lower parts of the land beneath the sea, and raise sea bottoms to form dry land. No study of the lands can promise the best results without a knowledge and appreciation of the conditions of the coast line and sea bottom. From this it is evident that the physiographic study of the ocean is broadly interrelated with the study of the land and air. The science of the study of the ocean is called oceanography; and, as in the case of meteorology, while the physiographer must understand the principles, his concern is far less with the science of oceanography than with the application of its principles to an understanding of their influence on life.

THE LANDS. There is a conflict of forces at the present time operating to modify the forms of the lands which themselves so greatly influence life. On the one hand contraction of the interior of the earth is causing changes in the level of the crust as a result of which continents are raised and ocean bottoms depressed, while mountain chains, volcanoes, plateaus, and plains are being made. On the other hand opposing forces are at work on the land removing the rocks that lie above the sea level and dragging the fragments into the sea. The weather disintegrates the rocks, the rains, rivers, and winds remove the fragments. Glaciers occasionally aid in this erosion, and the seacoast is the seat of further important work of this kind. The result of the opposing forces of elevation and destruction has been to produce a very complex land surface, and it is one of the most important provinces of physiography to understand this land surface and to point out its effect on life. For this phase of physiography the name geomorphology has been proposed. It is intimately related to geology and makes use of geological principles. It is by some considered as a branch of geology; that is, the geology of the present.

Many of the principles relating to the physiography of the lands are stated under other topics. (See RIVER; LAKE; MOUNTAIN, etc.) In this place only the scope of the subject will be indicated. The simplest land form is the plain (q.v.), the most extensive and perfect plains being on the sea bottom. They may be classified as constructional and destructional, the former being represented by elevated sea-bottom plains, lake-bottom plains, delta plains, flood-plains, etc.; the latter by plains of marine denudation, plains caused by lateral erosion of rivers, etc. In the beginning their surfaces are level, they permit the ready spread of animals and plants, and, if the climate favors, they are usually well suited to occupation by man. If newly formed, or young, the surface may be so level that water stands on it as lakes or swamps; but with increasing age the surface is drained, streams cut valleys, the flat-topped divides are narrowed, and the lakes and swamps are destroyed. In the development of these stream valleys, if the plain stands high enough above sea level, or base level, the rapid cutting along the channels permits the development of deep, steep-sided valleys. In these young valleys the vigorously working streams flow with rapid slope, and with occasional falls where hard layers are encountered. If the land is high above base level, that is, if it is a plateau, the young streams may so trench the land that travel across country is prohibited by the deep cañons. In such cases the interstream areas only are habitable and are chosen for roads and railways. With time the valleys broaden, the slopes become more gentle, and both the valley bottoms and sides invite settlement. Such a land surface is mature, and is well illustrated by the Mississippi Valley. There are few if any falls, the rivers are navigable, and they are bordered by flood plains—waste from the land along the course which the river is unable to bear to the sea over its gentle lower slope.

The Alps as a barrier to the spread of life, and as a refuge from invasion, stand as rugged mountains reaching above the snow line. Their ruggedness is due to their youth and to the fact that denudation, working high above base level, on rocks of very different degrees of hardness, has been able to work rapidly and scar and carve the mountains profoundly. With greater age mountain peaks and ridges are lowered, the valleys are broadened, and the rivers slowly shift position, eating their way backward at the headwaters, robbing weaker opponents of drainage area, and pushing their way across ridge after ridge, as in the Appalachians. The importance of the river gaps to transportation and the influence of mountains on occupation are observable throughout the world.

Rising land gives a straight coast, as along Western South America; sinking forms an irregular coast, with many islands, peninsulas, harbors, and straits, as in the Northeastern United States. A shelving coast of soft materials which has recently assumed its position is skirted by sandbars, like the coast south of New York, while a young coast of hard rock has bold headlands, with beaches in the bays. Here again are innumerable opportunities to study land forms in order to understand their cause and point out their influence on life.

The physiography of the lands investigates islands, peninsulas, capes, plains, plateaus, and valleys; it studies their differences in form; it distinguishes between the different kinds of hills,

cliffs, talus slopes, etc. In fact, it studies all land features, and in all cases it is concerned with the form, its cause, its relation to other land forms, and its effects on life. It shows how, in their conflict, the movements of the crust and the operation of the agents of denudation make land forms by constructional and by destructional processes. It shows that there is a constant building up of land forms by both the internal forces of elevation and the external forces of denudation; and that there is constant tearing down by the forces of denudation. It is the province of physiography to trace the operation of these processes, both to see how they modify the lands and to discover the influences of these modifications on life.

BIBLIOGRAPHY. Powell, Shaler, etc., *Physiography of the United States* (National Geographic Society Monograph, Washington, 1895); Huxley, *Physiography* (London, 1880); Mackinder, *Britain and the British Seas* (New York, 1902); Tarr, *Physical Geography of New York State* (ib., 1901); id., *New Physical Geography* (ib., 1897); Davis, *Physical Geography* (Boston, 1900); Shaler, *Nature and Man in America* (New York, 1897); id., *Sea and Land* (ib., 1894).

See GEOLOGY; GEOGRAPHY, etc.

PHYSIOLOGICAL SELECTION. A theoretical explanation proposed by Romanes of the evolution of species on the principle of the prevention of intercrossing. Hence Romanes also referred to the assumed law as that of the "Segregation of the fit." He was led to his generalization by consideration of the facts of sterility between species, and of fertility between varieties and races. Basing upon observation the postulate that the reproductive system was the most susceptible to change of any part of an animal's organization, he argued that in that system would often (perhaps more often than in any other) arise independent variations in individuals. If these were of such a character as to tend toward sterility between them and parent-forms, they would tend to separate the variety from the species and a new species would evolve. Romanes concluded that the principle of sterility between species was essential to the separate existence of species.

PHYSIOLOGY (Lat. *physiologia*, from Gk. *φυσιολογία*, natural philosophy, from *φυσιολόγος*, *physiologos*, discoursing on nature, natural philosopher, from *φύσις*, *physis*, nature + *λόγος*, *logos*, word, account, ratio, from *λέγειν*, *legein*, to say). Under the term physiology, when used in its widest sense, we include all that is known of the properties of living matter. Following the great line of demarcation of living things into animals and plants, we have an animal physiology and a plant physiology. The two subjects, while closely related, are sufficiently different to be considered as separate sciences and to require specialists of different training for their study. In animal physiology we have to deal especially with the properties of animal protoplasm, and although the fundamental properties of this material are believed to be much the same in all animals, yet for each animal or group of animals there are minor distinctions which are due in part to fundamental differences in structure, and in part to the variety in the physiological mechanisms developed in different animals. In what follows an attempt will be made to present briefly an outline of the important facts and principles of human physiology, but it should be remembered that the body of facts included under this designation have been obtained in many, if not in most cases, by direct study and experiment upon lower forms of life, not only upon the mammals most closely related in structure to man, but also upon the simplest organisms which for one reason or another have offered especial opportunities for study.

It is convenient to consider the physiology of the human body under two general heads, namely, the properties of the tissues and the properties or functions of the organs and mechanisms. The human body, like that of other animals, starts as a single cell, the fertilized ovum. During the progress of development this cell multiplies to form an infinite number of cells which gradually become differentiated in structure and segregated into groups that are known as tissues. Each tissue is characterized by its appearance, as seen by the eye or with the aid of a microscope, and also by known differences in chemical composition and reaction. We distinguish in the human body the muscular tissue, the nervous tissue, the epithelial tissue, the gland or secreting tissue, the blood, the connective or supporting tissue, the lymphatic tissue, the tissue forming the red blood corpuscles, and so on. Each tissue is different not only in structure, but in its properties. Along with the differentiation in form there is a specialization in function. Without attempting to describe their microscopic characteristics, a word or two may be said of the more important physiological properties of some of these tissues.

THE MUSCULAR TISSUES. In man, as in the other vertebrates, we distinguish three kinds of muscular tissue: (1) the cross-striped or voluntary muscle which forms the musculature of the body by means of which our voluntary movements are made; (2) the heart-muscle, composing the walls of the heart; and (3) the plain or unstriped muscle which is found in the walls of the hollow viscera, such as the alimentary canal, the blood-vessels, the uterus, the bladder, etc. The common characteristic of these three tissues is the property of contracting. While this property may occur in other tissues, it reaches its greatest development in the muscles. In cross-striped muscles the contraction is always started by a stimulus received through the nerves and originated usually in the brain by an act of the will. The contraction is very rapid. A single stimulus gives a single or simple contraction that occupies less than one-tenth of a second. All of our ordinary voluntary contractions are, however, compound or tetanic, that is, they are composed of a rapid series of simple contractions fused together more or less completely. The rapid series of contractions is due to a series of stimuli or nerve impulses received from the brain through the nerve fibres connecting it with the muscle. In every voluntary movement, therefore, whether short or prolonged, we must imagine to ourselves a series of changes in the nerve cells of the brain, which are propagated along the connecting nerve fibres to the muscle or muscles and there set up a series of contractions so rapid that they become fused into a long lasting contraction or movement.

Plain muscle is characterized by the slowness of its contractions. The tissue as found in different parts of the body varies somewhat in this respect, but in all cases its contractions are very

much slower than in the cross-striped muscle. The plain muscle, moreover, is not under voluntary control; we are not conscious of the movements of the stomach, the blood-vessels, etc. The contractions of these organs are brought about by stimuli conveyed to the muscle through the so-called sympathetic nervous system. The slow and prolonged contractions of plain muscle explain the gentle, long-continued movements of the viscera such as occur in the action of the stomach and intestines in propelling food along their length. Heart-muscle is somewhat intermediate in structure between the plain and the cross-striped varieties. Its contractions are also intermediate in duration, but approach closer to the quick movement of the striped muscle. The predominant characteristic of heart-muscle, however, is its property of making spontaneous rhythmic contractions which are due not to external stimuli received through the nervous system, but to processes arising within itself. To this property is due the rhythmic beat of the heart.

Nervous Tissue. The nervous tissue is found in the brain, the spinal cord, the nerve ganglia of the sympathetic system, and the peripheral nerves or nerve trunks distributed throughout the body. The nerve tissue consists of nerve cells and their processes. The body of the cell lies in the nerve centres, that is, the brain, the spinal cord, and the ganglia, and the typical cell has two kinds of processes, one comparatively short and much branched, known as the dendrites or dendritic processes, the other but little branched and in some cases very long, as much as two or three feet. This latter branch is known as the axis-cylinder process; it may pass out of the nerve centres to be distributed to the other tissues forming the essential part of what we call nerve fibres. It is important, therefore, to bear in mind that nerve fibres are essentially long processes from nerve cells and form the mechanism by which the nerve centres are connected with and influence the activity of the peripheral tissues. Physiologically, the important function of a nerve fibre is to conduct a change or process known as the nerve impulse. This impulse travels along the fibre at a rate of about one hundred feet per second. The nerve fibres fall into two great groups, those that convey impulses from the peripheral tissues to the nerve centres, and those that convey impulses from the centres toward the periphery. The former group compose the afferent or sensory fibres, the latter name being used because in many cases the impulses finally reach the brain and give rise to conscious sensations of various kinds. In many cases, however, the impulses conveyed to the nerve centres by the afferent fibres cause no change in consciousness, but manifest themselves by what we call reflex effects, as, for instance, in the movements of the intestines, the blood-vessels, or the heart. The group of fibres that carry their impulses outward from the centre to the peripheral tissues compose the efferent or motor fibres. If these fibres end in muscles, the effect of their impulses is the production of a muscular contraction; if they end in a gland, they cause a secretion; the nature of the resulting action depending on the kind of tissue with which the nerve fibre is connected. It should be stated that there is no known difference in structure between afferent and efferent nerve fibres. Each, like a telegraph wire, can conduct an impulse in either direction. But just as a telegraph wire with a sending apparatus at one end and a receiver at the other is arranged to conduct messages only in one direction, so the afferent and efferent nerve fibres, by the peculiarities of their end connections, are arranged so that normally they can convey effective impulses only in one direction. What we call a nerve or a nerve trunk consists of many hundreds or thousands of nerve fibres belonging usually to both the afferent and the efferent group. Though combined in one bundle, each fibre is physiologically independent and may act alone or in combination with others in the same trunk. In a muscle, on the contrary, the hundreds or thousands of muscular fibres of which it is composed act usually as a unit, all contracting together when the muscle is in action.

Reflex Actions. A large part of the beautiful adaptation and coördination of the different parts of our bodies is effected by the reflex activities of the nervous system entirely outside our conscious knowledge. The way in which these reflexes are produced is illustrated best by the simple reflex movements that can be obtained from a headless frog. If in such an animal, with its spinal cord intact, one of the toes is gently pinched, the leg will at once be drawn in toward the body. If the skin is stimulated by bits of paper moistened with dilute acetic acid, the leg of the corresponding side will be raised and the piece of paper will be wiped off by a neat movement involving the coördinate activity of a number of muscles. What happens in these cases is that the stimulus applied to the skin irritates the sensory nerve fibres and sends in a stream of nerve impulses to the spinal cord. These impulses are conveyed to the dendrites of certain motor nerve cells and arouse in them fresh impulses which are conducted outward through the efferent nerve fibres to the muscles. The original stimulus, or, more accurately, the nerve impulses to which it gives origin are thus, as it were, reflected in the nerve centres and sent to the peripheral tissues, whence the name of reflex action. Every such reflex involves the activity of at least two groups of nerve cells, one connected with the sensory fibres stimulated and one connected with the efferent fibres going to the muscles. Such reflexes may occur in all parts of the spinal cord and brain. A common reflex in ourselves, for instance, is the winking of the eye when its sensory surfaces are touched. As a rule we limit the term reflex action to those cases in which the element of consciousness is not involved. As a matter of fact, however, all of our conscious processes and mental activities are effected by a similar action of one nerve cell or unit on another, the mechanism in action being essentially similar to, although more complex than, the simple reflexes of the spinal cord. In a mammal as well as in a frog it can be shown that if a part of the spinal cord is severed from its connections with the brain, under such conditions that death does not result at once, the part of the cord below the injury will suffice to effect complex movements upon appropriate stimulation of the skin. To the uninformed such movements usually suggest consciousness, but the evidence of physiology proves conclusively that they are entirely unconscious reflexes.

It should be added that the outgoing impulse in reflex stimulation of the cord or brain may proceed through nerve fibres connected with other

tissues such as the heart-muscle, the plain muscle of the viscera or the glands, and the reflex effect, instead of exhibiting itself as a movement of the limbs, may take the form of a secretion, of a change in the heart beat, or of a constriction or dilatation of the blood-vessels. Owing to the complexity of the connections among the numerous nerve cells in the spinal cord and brain, it is evident that reflex effects may be widespread and very intricate. Certain definite paths or connections are inherited or become acquired during life from repeated use, so that the passage of a sensory nerve impulse that reaches the central nervous system is not haphazard, but for the most part along predetermined paths. The wonderful instincts of the lower animals may be regarded as complicated reflexes, and the unconscious regulation of the different parts of our body, especially the activity of the internal organs or viscera, is controlled in this way by the nervous system.

The Circulatory Mechanism. The anatomical mechanism for the circulation of the blood and lymph consists of the heart, the blood-vessels, and the lymph-vessels. With regard to the blood we have the central fact that the powerful musculature of the heart serves as a force-pump driving the blood out from the ventricles through the circuit of the blood-vessels and back to the heart. The system of arteries branching from the heart resembles a tree with its central trunk and its vast number of branches of different sizes. As one goes outward from the heart toward the periphery, the arteries distributed to each organ become smaller and smaller until they end in minute capillaries. The combined area of these branches increases, however, toward the periphery, so that the sum of the areas of all the capillaries arising from the aorta is several hundred times as great as that of the aorta itself, just as the combined diameters of all of the twigs of a tree would much exceed that of the trunk. The quantity of blood being practically the same at all times, it becomes distributed as it goes out from the heart over a wider and wider area, or, to use a convenient figure, flows through a wider and wider bed. As a result of this fact the velocity of the blood-flow becomes smaller as we approach the capillaries. While in the aorta the blood may flow with a velocity of 300 millimeters per second, in the capillaries the velocity becomes reduced to $\frac{1}{2}$ millimeter. In the venous system the same general fact holds true. The capillaries unite into larger veins, and these into still larger ones, until finally all of the blood in the aortic system is collected into two large veins, the superior and the inferior vena cava, which open into the auricles. As a consequence the blood, as it flows back to the heart, passes through a path that becomes narrower and narrower, and its velocity increases proportionately. With regard to the velocity of the blood-flow, therefore, we can state that it is greatest in the large arteries and veins and least in the capillaries.

In the arteries, moreover, the blood is under a much greater pressure than in the capillaries and veins. From a cut artery the blood spurts to some distance, while from a cut vein the blood flows out quickly, but with little force. The cause of this difference is easily understood. In flowing through the vessels the blood encounters considerable resistance. Naturally this resistance is greatest in the capillaries and in the small arteries and veins communicating with them. On account of the great resistance in the capillary region, known technically as the peripheral resistance, the blood is dammed up, retarded on the arterial side, stretching the elastic walls of the arteries and putting the blood under a considerable tension. In the capillaries the pressure of the blood is much less, and in the veins it becomes smaller and smaller as we approach the heart. Physiologically the most important part of the blood-circuit is in the capillaries. While flowing through these thin-walled and very minute vessels the blood fulfills its function of nourishing the tissues. At this point the blood, while still under some pressure, is flowing at its slowest rate, and the liquid part of it, the blood plasma, transudes through the thin walls and comes into direct contact with the tissues, thus forming the tissue-lymph. The oxygen carried by the red corpuscles of the blood is liberated in the capillaries and diffuses from the blood to the tissues, being transported to the latter while held in solution in the lymph. The lymph gives up its food materials and oxygen to the tissue cells and at the same time receives from them the waste products and carbon dioxide formed during their nutritive activity. The lymph is prevented from accumulating in the tissues by the fact that it is continually drained off by the system of lymphatic vessels. These vessels form a system parallel in course and structure to that of the veins. They begin in the tissues by small capillaries which unite to larger and larger vessels, forming eventually two main trunks that open into the veins of the neck. By this arrangement the excess of lymph is continually drained off and returned to the blood. The means by which the supply of lymph is regulated forms one of the most interesting and difficult subjects of study in modern physiology.

The heart and blood-vessels are not a fixed and rigid system. On the contrary, they are supplied with nerves through which the beat of the heart and the capacity and resistance of the blood-vessels may be reflexly adapted to the different conditions of the body as a whole, or the individual needs of its separate parts. The heart receives two sets of nerve fibres; one, the inhibitory fibres, are capable of slowing the heart-beat; the other, the accelerative fibres, quicken the rate. The small arteries, on the other hand, receive also two sets of nerve fibres; one, the vaso-constrictors, causes a diminution in size of the blood-vessels, while the other, the vaso-dilators, brings about an increase in size. The numerous conditions under which these regulating nerve fibres act are too complex to be described here. The mechanism is so adjusted as to control automatically the supply of blood to different organs under varying conditions of rest and activity.

The Respiratory Mechanism. In mammals like ourselves the chief organ of external respiration is the lungs. When the inspiratory muscles are contracted the chest is enlarged and air flows into the lungs. When the expiratory muscles are contracted the chest is diminished in size and air is forced out of the lungs. In ordinary respiration the expiratory act is entirely passive; the chest, expanded by the action of the inspiratory muscles, sinks back into its normal position when these muscles cease to act. In forced breathing,

however, the expiratory muscles come into action. By means of these respiratory movements the air in the lungs is continually renewed, the supply of oxygen is maintained, and the carbon dioxide is removed. The oxygen contained in the air sacs of the lungs diffuses through their thin walls, and, coming into contact with the blood, it unites chemically with the coloring matter of the red corpuscles, the hæmoglobin. In this combination it is carried to the heart, and thence distributed over the body through the various arteries. When the blood reaches the capillaries the compound of hæmoglobin and oxygen is broken or dissociated by the physical conditions there prevailing, while the liberated oxygen passes into solution in the blood plasma and lymph, and is thus conveyed to the tissues. On the other hand, the general nutritive change or metabolism of the tissues results in the formation among other things of carbon dioxide. This substance is a waste product, and if it accumulates in the tissues, brings on a suppression or perversion of the normal nutritive processes. Under normal conditions, however, it is rapidly removed by the lymph and blood. As the oxygen passes from the blood to the tissues by diffusion through the thin-walled capillaries, so the carbon dioxide as rapidly as it is formed streams in the opposite direction from tissues to blood. Each gas follows the physical law of diffusion from a point of greater to one of less tension. Within the blood the carbon dioxide is held mainly in chemical combination, partly with the proteids of the blood plasma, partly with the proteids of the blood corpuscles. When the blood reaches the lungs this loose chemical union breaks down, the carbon dioxide is liberated and diffuses into the air-sacs of the lungs, whence it is given off in the expired air. The process of respiration, therefore, may be divided into two parts, external and internal respiration. Under the former term we include all the processes involved in the movement of air into and out of the lungs, and the exchange of oxygen and carbon dioxide between the blood and the air in the lungs. By internal respiration we mean the exchange of oxygen and carbon dioxide between the tissues and the blood as well as the processes of nutrition by means of which the oxygen is used and the carbon dioxide produced. What we call arterial blood differs from venous blood in that it contains more oxygen and less carbon dioxide, and to this difference in the gaseous contents is due also the well-known variation in color, arterial blood having a scarlet tint, while the venous blood is purplish or crimson. The machinery for the movements of respiration, that is, the respiratory muscles, are under the control of the central nervous system. These muscles may be influenced within certain limits by direct voluntary effort; but a far more important factor is their unconscious or reflex regulation exerted through the respiratory nerve cells or nerve centre found in the medulla oblongata. By the activity of this centre the respiratory movements are kept continually in play and the extent of the respirations is adjusted to the needs of the body.

Digestion and Nutrition. The living matter of the animal body is characterized, as compared with plant protoplasm, by its limited powers of assimilation. While the latter can construct living matter from comparatively simple inorganic material, such as carbon dioxide, water, and nitrogen containing salts, the former requires food in the more complex form of organic material. Since in the last analysis this organic food is derived from the plant kingdom, it may be said that the maintenance of animal life is only possible through the synthetic activity of plant protoplasm. All of our varied foods are found upon analysis to be composed of essentially the same materials united in different proportions. These constituent materials of our foods are known as food-stuffs and are usually classified as *proteids*, *fats*, *carbohydrates*, *water*, and *salts*. Of these substances the water, inorganic salts, and proteids are absolutely essential. The two former are necessary to the composition and reactions of the living tissues, but they do not directly furnish any energy to the body. The requisite amount of water is controlled by the sensation of thirst, and the proper proportions of the inorganic salts are provided in our foods without the necessity of any conscious selection on our part, except perhaps in the case of sodium chloride. Proteid foods have a different value. They are complex nitrogen-containing compounds which in the body are destroyed and reduced to much simpler substances, namely, carbon dioxide, water, and urea. This destruction of proteid is essentially an oxidation, and as much heat is given off in the process as would be liberated outside the body by burning proteid to the same end-products. Proteids are an absolutely necessary constituent of food, because they contain nitrogen in a form capable of being used in the construction of living matter. Fats and carbohydrates, since they contain no nitrogen, cannot be used alone in the synthesis of protoplasm. They are nevertheless valuable foods, since they are readily destroyed or burned in the body with the liberation of energy in the form of heat or muscular work. In a normal diet proteids, fats, and carbohydrates are usually combined in certain proportions, and experience as well as direct physiological experiments show that within limits the fats and the carbohydrates may be interchanged, and furthermore the greater the amount of these two substances used the less will be the amount of proteid required; or as we say in physiology, fats and carbohydrates are 'proteid-sparers.'

The nutritive history of these three energy-yielding foods may be summarized briefly as follows: The proteids in whatever form they may be taken are digested partly in the stomach by the action of the gastric juice and partly in the intestines by the action of the pancreatic juice. By the act of digestion the food proteids are converted into simpler and more soluble forms known as peptones and protoses, which are then absorbed into the blood and carried to the various tissues. Here they are utilized in part to form protoplasm, either to replace that broken down in metabolism or to supply material for growth. But much the larger part of the proteid is simply destroyed in the tissues with the transformation of some of its chemical energy into a corresponding amount of heat. The fats are prepared for digestion in the stomach, but undergo the important change that fits them for absorption after they are brought into contact with the pancreatic juice in the small intestine. After absorption they are found in the blood and lymph for a time, but soon pass into the tissues. Here they may be deposited as part of our normal store of

body-fat, but with the usual diet of adult life they are supposed to be completely burned. It is known from experiments that one gram of fat burned outside or inside the body yields as much heat as 2.2 grams of proteid. The carbohydrates include the starches and the sugars which from a nutritive standpoint have the same value. The starches form the bulk of our diet, and they are digested partly in the mouth by the action of the saliva, but mainly in the small intestine by the action of the pancreatic secretion. Under the influence of these secretions the starches are converted into a form of sugar, which is then absorbed into the blood. As the blood from the intestines passes through the liver this absorbed sugar is removed and again converted into a form of starch known as glycogen, which is deposited or stored in the liver cells. From time to time the glycogen is reconverted to sugar and given off to the blood. The regulating mechanism controlling this production and conversion of glycogen is so adjusted that under the normal conditions of life the blood always contains a nearly constant amount of sugar. Sugar, therefore, is the final form in which all of our carbohydrate food is brought to the tissues—and under the influence of the living matter it is eventually oxidized to carbon dioxide and water. In the long run, therefore, the final fate of our food is to be burned and furnish energy in the form of heat, muscular work, etc. The continual consumption of food is necessary to maintain the body temperature, and in the body we have very complex regulating mechanisms which control the loss of heat and to a certain extent its production, with the normal result that the temperature of the body remains nearly constant under all the varying conditions of life. It has been shown with scientific accuracy that all the detectible energy given off from the body is derived directly from the food consumed. The energy value of any food can, therefore, be determined by ascertaining the amount of heat produced by burning it, or more conveniently by ascertaining the heat value of proteids, fats, and carbohydrates, and then analyzing the food to determine how much of these three foodstuffs is contained in it.

The Central Nervous System. Some statements regarding the structure of the nervous system will be found in the beginning of this article. (Consult also the article on Nervous System and Brain.) At the base of the brain immediately adjoining the spinal cord we have the medulla oblongata. In this part of the brain are found certain important collections of nerve cells which control the movements of respiration, of the heart, and of the blood-vessels, their activity being entirely unconscious and under the influence of reflex stimulation. Collections of nerve cells connected with and regulating the action of physiological mechanisms are known as nerve centres, and in the medulla we recognize the existence of the three centres mentioned and designate them as the respiratory centre, the cardio-inhibitory centre, and the vaso-motor centre. They and other similar centres regulate the activity of the visceral organs, whose functions are discharged for the most part without our conscious knowledge or control. Injury to the medulla or severance of its connections with the spinal cord is fatal at once, owing to the destruction of the connections of the respiratory centre with the respiratory muscles and the consequent inability to breathe. In the cerebellum we have an organ which seems to control the coördinated activity of the voluntary muscles. Extensive injury to the cerebellum, while not accompanied by actual paralysis, renders the animal incapable of executing orderly movements. If the animal survives the injury, the ability to make coördinated movements may be recovered more or less completely, but some awkwardness and muscular weakness persist as permanent results. In the nerve cells of the cerebral hemispheres we have the seat of the conscious sensations and of all the so-called psychic activities. Modern physiology has shown that different parts of the cerebral hemispheres have different functions. The optic nerve fibres end eventually in the occipital lobes, and here our conscious sensations of vision are mediated. A similar arrangement prevails for the other senses. In the cortex of gray matter covering the cerebral hemispheres there are in fact certain sense areas each of which mediates a different kind of consciousness. Other areas are connected with the various muscles of the body and form the centres through which our voluntary movements are executed, while in still other regions we have areas in which are stored the memories of past experiences and in which the factors of sensation are organized into the complex associations that characterize our mental life. Injuries to the brain may, therefore, be followed by quite different results according to the region involved. There may be a paralysis of this or that group of muscles, a loss of this or that primary sensation, or a disturbance or perversion of this or that group of memory associations. The so-called aphasias form noteworthy illustrations of these facts. Injury to certain limited areas of the brain may result in a partial or complete loss of the power of speech, or of the ability to understand either written or spoken language without any interference with vision or hearing. When defects of this character exist it is possible to locate the probable seat of the lesion, and not infrequently this knowledge has been made the basis of successful surgical operations.

History of Physiology. The history of physiology is coextensive with that of medicine. Its relatively slow advancement through many centuries was closely associated with the growth of anatomical, chemical, and physical knowledge. In modern times, however, dating perhaps from the first part of the nineteenth century, physiology has become an independent science with a technique peculiarly its own, yet adopting more and more the exact methods that have arisen in the sciences of physics and chemistry. This development of physiology has been especially marked since investigators abandoned the idea of a special vital force controlling the phenomena of life and set themselves to the task of explaining the properties of living matter in terms of the forms of energy recognized as responsible for the phenomena of inanimate nature. The great facts in physiology, as in other subjects, have been discovered in a few cases only by the genius of individual workers. In most instances they have developed gradually as the result of the combined labors of many investigators, so that a history of the growth of the fundamental principles of modern physiology involves a discussion of the progress of the natural sciences in gen-

eral. Every important advance in physics and chemistry has influenced and will continue to influence the development of physiological knowledge. Some of the significant discoveries that belong especially to physiology and that can be traced more or less exactly to a definite period and individual observers are as follows: The circulation of the blood (Harvey, 1616-28); the existence of the lymphatic system of vessels (Aselli, 1622); the microscopic structure of the lungs, capillaries, glands, and other tissues (Malpighi, 1660-90); the discovery of the mammalian spermatozoön (Leeuwenhoek, 1678); the method of direct measurement of blood-pressure (Hales, 1732); the independent irritability of muscle (Haller, 1757); the discovery of oxygen and its functions in respiration (Lavoisier, 1775); the digestive action of gastric juice (Réaumur, 1752); the distinction between motor and sensory nerve fibres (Bell and Magendie, 1811-22); the discovery of the mammalian ovum (Von Baer, 1827); the true nature of the secretions of glands (Johannes Müller, 1830); the existence of enzymes, unorganized ferments, in the gland secretions and saliva—diastase (Leuchs, 1831); pepsin (Schwann, 1836); the nature of reflex actions (Marshall Hall, 1837); the electrical phenomena of muscle and nerve (Du Bois-Reymond, 1843); the existence of inhibition and inhibitory nerve fibres (Weber, 1845); the introduction of the graphic method in physiological experimentation (Ludwig, 1847); the existence of secretory nerve fibres (Ludwig, 1851); the existence of vaso-motor nerve fibres (Bernard, 1851); the existence and functions of glycogen (Bernard, 1857); the function of hæmoglobin in respiration (Hoppe-Seyler and Stokes, 1862-64); the localization of function in the cerebrum (Fritsch and Hitzig, 1870); the establishment of the fact of internal secretions (Brown-Séquard and others, 1891). For full information, consult: Foster, *Text-Book on Physiology* (Philadelphia, 1885); *The American Text-Book of Physiology* (2d ed., ib., 1900); Schäfer, *Text-Book of Physiology* (New York, 1900). For details of the histological features, consult Piersol, *A Text-Book of Normal Histology* (Philadelphia, 1901).

PHYSIOLOGY OF PLANTS. History. Up to the close of the seventeenth century nothing was known of the physiology of plants beyond the scattered impressions derived from the practical cultivation of plants in fields and gardens. Inasmuch as the physiology of animals was better known, the first study of the actions of plants was an endeavor to identify plant functions with those of animals. As the functions of animals were only superficially known, this attempted identification led oftentimes to most egregious errors. But as the nature of animal functions became better known, the essential identity of the processes in both sorts of living beings became more evident. At first the study of physiology was scarcely more than an enumeration of plant activities and their comparison with those of animals. Later, however, [illegible] were made to investigate the causes and conditions of the functions. For this a knowledge of [illegible] was recognized as of prime importance. Deeper insight into physiology, however, [illegible] knowledge of physics and chemistry; [illegible] only when these two sciences under[illegible] progress found transformation and extension that explanations of plant phenomena began to be possible. Among the earliest investigations after the revival of learning were those made in Italy by Malpighi on the movement of sap, and those of Ray on the influence of light upon the colors of plants. About the same time in Germany Camerarius proved the necessity of pollen for the formation of fertile seeds.

Early in the eighteenth century Hales published his studies on the movement of sap and the evaporation of water from the leaves. Later in the eighteenth century came the investigations of Koelreuter, who added to the knowledge of sexuality in plants by his experiments on hybridization. It was in connection with these experiments that the relations of insects to pollination were first pointed out. Later (1793) these interesting relations were set forth at length by Christian Konrad Sprengel, whose famous "Das entdeckte Geheimnis der Natur" was scarcely appreciated until the contributions of Darwin had opened the eyes and understanding of naturalists to Sprengel's extraordinary work. About the same time Ingenhouss showed that the green parts of plants when illuminated absorb carbon dioxide and eliminate oxygen, thus deriving the carbon which they need from the atmosphere. He also showed that the living parts of plants absorb oxygen, whether illuminated or not, and evolve carbon dioxide, thus establishing the fundamental facts of nutrition and respiration. This work was further confirmed by Senebier, who demonstrated that the decomposition of carbon dioxide takes place only in green organs. He also studied the influence of light upon the growth and green color of plants. By the beginning of the nineteenth century Nicolas Théodore de Saussure had shown that plants not only fix carbon from carbon dioxide, but also use the elements of water, which, with the mineral salts, are a necessary part of the food materials. Between 1822 and 1832 De Saussure and Goeppert established the connection between the respiration of plants and the development of heat in their bodies. Through the influence of Liebig, about the middle of the century, Ingenhouss's clear exposition of the respiration of plants, which had been fairly established, was discarded, to be reinstated in confidence only after 1860 by the father of modern vegetable physiology, Julius von Sachs. Yet Liebig's valuable work in connection with the chemistry of foods and food materials of plants and Boussingault's investigations in France, especially in relating the known facts to the empirical processes of agriculture, were of great service to both cultivators and physiologists. The year 1860 marks the rise of modern physiology, as indeed it does the rise of modern biology, many cooperating causes, the most notable of which was the publication of Darwin's *Origin of Species*, furnishing the impulse to renewed investigation.

Scope. As a science, plant physiology concerns itself with every inquiry relating to the functions and behavior of living plants. Certain aspects of physiology, namely the relation of living plants to the environment, physical (including soil, water supply, temperature, etc.) and biological (i.e. other plants and animals), have recently been separated from physiology proper and named ecology (q.v.). Physiology proper restricts itself to the activities of the individual

plant. Its study demands a previous knowledge of the anatomy (q.v.) and histology (q.v.) of plants, since familiarity with plant mechanism must precede the knowledge of plant function.

The functions of plants may be divided for convenience into certain groups. *First*, processes connected with the absorption of materials by the plant from the surrounding medium. Everything which enters the plant body must do so in solution. The plant depends, therefore, fundamentally upon water, which, with an infinite variety of solutes, both solid and gaseous, it absorbs. (See ABSORPTION.) *Second*, processes by which materials escape from the plant body. Gases, especially carbon dioxide and oxygen, are evolved (see AËRATION; OSMOSIS); a great variety of materials are eliminated from the plant body by various processes of secretion (q.v.); and water is evaporated in great quantity by the surfaces of land plants. (See TRANSPIRATION.) *Third*, processes by which water and foods are moved about from the points of absorption or manufacture to the points of use, storage, or loss. But in spite of the fact that the movement of water was almost the first subject that attracted the attention of observers, no satisfactory explanation has yet been devised. (See CONDUCTION.) *Fourth*, processes of nutrition. Carbohydrate foods are made only by green plants under the influence of light, a power which is of the utmost importance, since the commercial supply of food and energy depends at present almost wholly upon green plants. The making of carbohydrates is fully described in the article PHOTOSYNTHESIS. (See CHLOROPHYLL; CHLOROPLASTS.) All plants, however, make proteid foods, when the necessary supply of carbohydrates, nitrates, and salts is furnished. Proteid synthesis is discussed in the article FOOD OF PLANTS. When proteid foods are at hand, either through manufacture or absorption, they undergo various changes before they become a part of the protoplasm. (For what little is known of these processes, see ASSIMILATION.) *Fifth*, processes concerned with the release of energy in the plant body or adjacent to it, in such a way that the kinetic energy can be applied to such work as the plant must do. For most plants, these processes constitute respiration. (See RESPIRATION IN PLANTS.) For a few plants fermentation (q.v.) seems to replace, in part at least, the normal respiration. *Sixth*, processes of repair and growth. One of the important activities of the plant is the formation of new material or the rearrangement of old into new parts. The diverse operations involved in this constitute growth (q.v.). *Seventh*, processes of perception and response. Every function of the plant is more or less influenced by the changes occurring in its vicinity, whether these be entirely outside of the body or only in adjacent parts. In order to adjust itself to these changes the plant must receive impressions of them, and these impressions must result in appropriate adjustment. The changes in the protoplasm corresponding to changes in the surrounding medium and the chain of effects thus initiated, are said to manifest irritability (q.v.). The visible alterations of the rate of growth (q.v.) or in movement (q.v.) are most striking evidences of irritability. See CHEMOTROPISM; GEOTROPISM; HELIOTROPISM; HYDROTROPISM; MOTOR ORGAN; RHEOTROPISM; STIMULUS; TENDRIL; TRAUMATROPISM.

BIBLIOGRAPHY. Sachs, *History of Botany* (Eng. trans., Oxford, 1890); id., *Lectures on the Physiology of Plants* (Eng. trans., ib., 1887); Vines, *Lectures on the Physiology of Plants* (Cambridge, 1886); Goodale, *Physiological Botany* (New York, 1885); Pfeffer, *Plant Physiology* (2d ed., trans. by Ewart, Oxford, 1900); MacDougal, *Practical Text-Book of Plant Physiology* (New York, 1901); Green, *Vegetable Physiology* (London, 1901); Peirce, *Plant Physiology* (New York, 1903). In experimental plant physiology consult the following: Detmer, *Practical Plant Physiology*, trans. by Moor (London, 1898); Darwin and Acton, *Practical Physiology of Plants* (Cambridge, 1894); Ganong, *An Elementary Course in Plant Physiology* (New York, 1901); MacDougal, *Experimental Plant Physiology* (ib., 1895). A brief and elementary summary of plant physiology will be found in Barnes, *Plant Life* (New York, 1898).

PHY'SODON (Neo-Lat., from Gk. *φύσα*, *physa*, bellows, breath, bubble + *ὀδούς*, *odous*, tooth). An extinct sperm whale known by its skull, found in the Miocene formations of Patagonia. It differed from the modern sperm whale in having enamel-capped teeth in its upper jaws. See CETACEA.

PHYSOSTIG'MA. See CALABAR BEAN.

PHYTOGEOGRAPHY. See DISTRIBUTION OF PLANTS.

PHYTOLAC'CA (Neo-Lat., from Gk. *φυτόν*, *phyton*, plant + Neo-Lat. *lacca*, lac, from Per. *lak*, *luk*, Hind. *lākh*, from Skt. *lākṣā*, lac-insect, from *lākṣā*, hundred thousand, referring to the numbers of insects in each nest; so called from the crimson juice of the berries). A genus of about 20 species of dicotyledonous herbs and half-shrubs of the natural order Phytolaccaceæ, natives of warm parts of Asia, Africa, and America. *Phytolacca decandra*, the poke or pocan, a native of North America, now naturalized in some parts of South Europe, is occasionally cultivated for its young shoots, which are eaten like asparagus. The juice of the berries, which are about the size and color of black currants, is employed in the adulteration of wine. The young shoots of *Phytolacca acinosa* are boiled and eaten in the Himalayas. Under the name *Phytolacca esculenta* it has been introduced into gardens.

PHYTOLACCA (in medicine). Official under either of two forms, the fruit or the root of *Phytolacca decandra* or poke, also called 'pigeon-berry' and 'garget root.' The fruit is a small, deep purple compound berry, nearly round, with a sweet and slightly astringent taste. The root is "large, branched, fracture fibrous, inodorous, sweetish, and acrid" (Potter). A fluid extract and a tincture are the preparations used, besides the berry and root. Poke has been used in ulcers, certain tumors, eczema, sycosis, and other skin diseases, chronic rheumatism, mastitis, tonsillitis, and pharyngitis. It has been used to decrease adipose tissue and thus reduce obesity since 1858. When given in large doses, phytolacca causes nausea, depression, vomiting, and purging. It lowers the rate of respiration and weakens the heart's action, and has caused convulsions. See POKE and Colored Plate of POISONOUS PLANTS.

PIACENZA, pē'ä-chēn'tsä. The capital of the Province of Piacenza, Italy, situated on the right

bank of the Po [illegible] miles [illegible] its confluence with the Trebbia, 13 miles southeast of Milan (Map, Italy, D 2). The city is gloomy and desolate in appearance, though its thoroughfares are broad and regular. The Stradone is one of the most beautiful streets in Italy. Piacenza occupies a position of great strategic importance, and is fortified with solid walls and a strong castle. The Italian Government has strengthened and extended these fortifications by the construction of external defensive works, and by a formidable intrenched camp. The city has numerous fine palaces and churches. The attractive cathedral, an edifice in the Lombard Romanesque style, founded in the eleventh century, is interesting for the grotesque character of its interior decorations. It has frescoes by Guercino and L. Carracci. The Church of Sant' Antonino, the original Cathedral of Piacenza, has been several times rebuilt. Santa Maria di Campagna has excellent mural paintings by Pordenone. The noteworthy San Sisto, an ancient church rebuilt in the Renaissance, gave its name to Raphael's Sistine Madonna. Among the other principal buildings are the immense Palazzo Farnese, begun in 1558 and never completed, once famous, but now serving as barracks; the fine Palazzo Municipale, dating from the thirteenth century, with its arched arcades and pinnacles; and the Palazzo dei Tribunali with curious courts, now in ruins. The principal square is the Piazza de' Cavalli, so called from the colossal bronze equestrian statues of the Dukes Alessandro and Ranuccio Farnese. There are a public library with over 130,000 volumes, a splendid theatre built in 1803, two new theatres, several hospitals, and an arsenal. Piacenza has manufactures of silk, cotton and woolen goods, hats, pottery, and machinery, and a trade in wine, grain, cheese, and marble from its quarries. Population (commune), in 1881, 31,987; in 1901, 36,064.

Piacenza, the ancient Placentia, was founded by the Romans in B.C. 219. In B.C. 200 it was plundered and burned by the Gauls, but recovered its prosperity with the construction of the Æmilian military road, which had its western terminus here. In the twelfth century it became a member of the Lombard League. In 1545 Piacenza, along with Parma, was erected into a duchy for the Farnese family. (See PARMA.) An important battle occurred here in 1746 in which the allied French and Spaniards were defeated by the Austrians. Consult Giarelli, *Storia di Piacenza* (Piacenza, 1889).

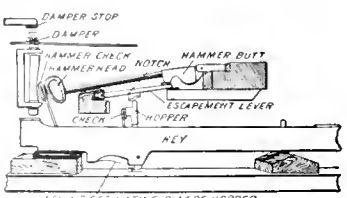
PIA MATER. See NERVOUS SYSTEM AND BRAIN.

PIAN'KISHAW. An Algonquian tribe, originally a band of the Miami, formerly residing chiefly upon the lower Wabash and claiming jurisdiction over most of southern Indiana and southeastern Illinois. When first known to the French, about 1670, they were in central Illinois, with the Miami and Illinois, and probably reached the Wabash about 1700. In 1832 they and the Wea sold all their claims in the east and agreed to remove to Kansas as one tribe. In 1867, having in the meantime consolidated with the remnants of the Illinois, they removed to the Indian Territory. They probably never numbered many more than 1000. In 1870 they were reported at 950, in 1895 at 800. In 1825 there were only 234 remaining in their original country, with a few others residing in Missouri. The whole body of mixed-blood Piankishaw, Wea, Kaskaskia, and Peoria together now number only 180.

PIANO (It., soft), abbreviated *p.* A sign used in music to denote that the strain where the indication occurs is to be played with less than the average intensity of force: *pp*, or *ppp*, for *pianissimo*, signifies very soft, or as soft as possible. *Piano* is used in contradistinction to *forte* (q.v.), and the transition from the former to the latter is indicated by the sign $<$; the change from *forte* to *piano* is marked by the opposite sign $>$.

PIANOFORTE (It. *pianoforte*, from *piano*, soft + *forte*, loud). A percussive instrument consisting of wire strings struck by felt-covered hammers, operated by keys arranged in a keyboard. It was directly evolved from the clavichord and harpsichord (qq.v.). The history of the pianoforte proper begins with the year 1709. Scipione Maffei in the *Giornale dei letterati d'Italia* (1711) gives a detailed account of four instruments built by Bartolommeo Cristofori (not Cristofali, as generally stated until quite recently), named by him *pianoforte* and exhibited in 1709. The earlier clavichord and harpsichord admitted no gradation of the loudness of tone. In order to render musical performances more expressive by a contrast of soft and loud tones, three different men about the same time turned their attention to this matter. These were the just-mentioned Cristofori in Italy, Marius in France, and Schröter in Germany. Marius exhibited some harpsichords with hammer-action in Paris in 1716, but it is not known that Schröter ever built an instrument or had one built for him. Schröter claimed to have invented the hammer-action between 1717 and 1721. But not until 1738, when Cristofori's instruments had become famous, did he come forward with his claim; and he waited even till 1763 before he published for the first time a drawing of his invention.

Cristofori's earlier instruments show a very simple form of escapement; the return of the hopper to a perpendicular position is secured by means of a spring. But there is no check to prevent the rebound of the hammer after striking

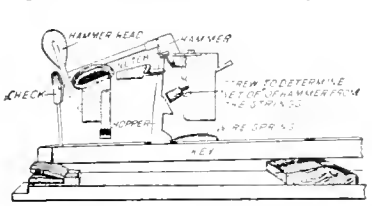


ACTION OF CRISTOFORI'S PIANO.

the string. Two later instruments, built in 1720 and 1726 respectively, have a device for checking. In order to withstand the force of the impact of the hammer it was necessary to use thicker wire than in the harpsichord. This thicker wire increased the force of the tension, and necessitated a strengthening of the supporting framework. The hammers were covered with leather, and every key had a damper. Thus the fundamental principles of our modern grand pianos are all found, though in a simpler form, in the instruments of Cristofori. The compass of these instruments was four to four and a half octaves. The action of

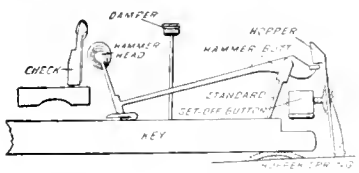
Cristofori was adopted in its essential features by the famous organ-builder Silbermann. His first instruments failed to win the approbation of J. S. Bach, who criticised them for their weak treble and heavy action. This led Silbermann to spend some years in experiments which finally resulted in success.

Up to 1760 all pianofortes were built in the shape of the modern grand. In that year Zumpe a German workman, settled in London and began to build instruments in the square form, which at once became very popular. About the same time other makers settled in London and practically made the English capital the centre of the world's pianoforte trade. About 1790 Broadwood, working upon acoustic principles, discovered the fact that when struck at a certain point the string would yield a fuller tone. Accordingly he adjusted the hammers so as to obtain this result. He also transferred the wrest-plank (the block in which the tuning pins are held) to the back of the case, and in 1783 invented the pedals: one by means of which all the dampers could be raised, the other to soften the tone by dropping a piece of cloth over the strings. In these improvements Broadwood had the advice and assistance of Backer and Stodard. The action as perfected by Broadwood has come to be known as the English action, and is generally in use today.



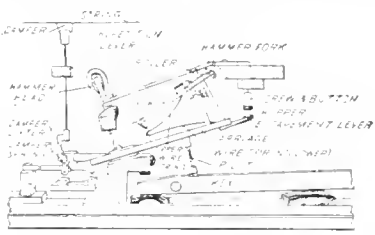
ENGLISH GRAND PIANOFORTE ACTION.

Meanwhile German manufacturers had not been idle. Stein, a pupil of Silbermann, invented a new action, which has become famous as the Viennese action. While in Cristofori's (English) action the axis of the hammer does not change, because the hammer is fixed upon a lever separate from the key, Stein attached the hammer directly to the rear end of the key itself, causing a change of axis of the hammer when the key is struck. This produced the extreme lightness characteristic of the Viennese action. Stein's



STREICHER'S GRAND PIANOFORTE ACTION.

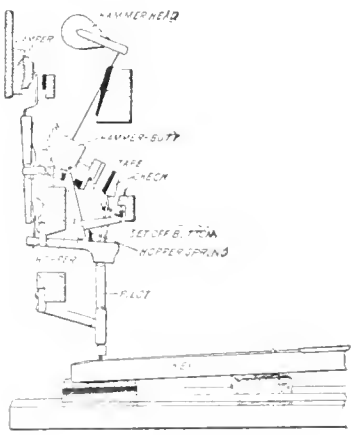
son-in-law, Streicher, in 1794 further improved this action and established a great reputation for his instruments. France was supplied chiefly with English pianos until Erard (a German whose name originally was Erhardt) settled in Paris in 1777. The Revolution drove him to London, where he made himself thoroughly familiar with English methods. Even after his return to Paris Erard continued to use the English action, but meanwhile he was seeking some improvement. His experiments resulted in 1821 in the double escapement action, which soon spread the fame of Erard all over the world. The next important manufacturer in France was again a native German, Pape, of Hanover. Pape invented, in 1827, a down-striking action where the action is above



FRENCH GRAND PIANOFORTE ACTION.

the strings. He also substituted felt for leather in the covering of the hammers (1839). But this departure had already been made a few years previous by Babcock, of Boston.

In order to save space, some English makers toward the end of the eighteenth century conceived the idea of building pianos in an upright form. The first attempts consisted in nothing more than turning a grand or square instrument on one side. The first genuine upright was patented (1800) in England and the United States by John Isaac Hawkins, an Englishman living in the latter country. It is remarkable for containing most of the features which distinguish the modern upright. In the direct line of piano development, however, we owe a greater debt of gratitude to Southwell, who after fourteen years of experimenting exhibited the first upright piano that yielded practical results in 1807. This he called the 'Cabinet.' In 1811 he built another instrument which shows many decided improvements. Wornum still further improved this



ENGLISH UPRIGHT PIANOFORTE ACTION.

model by the introduction of diagonal stringing. The increased length of the strings yielded a more powerful tone. He also invented a new action principle (the so-called lever-check action), which was taken up and further improved by Pleyel of Paris, in which form it became known as the French action.

It must not be imagined that the pianoforte immediately upon its appearance at the beginning

of the eighteenth century superseded the harpsichord or clavicembalo. These instruments continued to be made; especially the clavicembalo kept its position in the orchestra throughout the century. Composers still wrote for the harpsichord. The earliest known composition written especially for pianoforte appeared in 1771. The composer, a certain Müthel, entitles it "Duetto für zwey Claviere, zwey Fortepiano oder zwey Flügel." But the technique is not different from that of the harpsichord. The first compositions written especially for the pianoforte and showing a technique characteristic of the new instrument are three sonatas (op. 2) by Muzio Clementi, published in 1773. From that time on composers began to study the peculiarities of the pianoforte and to employ the proper technique. The colossal pianoforte works of Beethoven were destined to revolutionize the manufacture of pianofortes. Many of his pianoforte works were beyond the capabilities of the instrument at that time. Thus he gave a powerful stimulus to piano-builders to increase both the compass and power of the pianoforte. In order to obtain power of tone the *thickness* of the strings had to be increased; to extend the scale the *number* of strings had to be increased. Manufacturers had to devise some frame capable of withstanding this enormous increase of tension. This led to the use of metal. In 1820 Allen and Thom patented a frame consisting of hollow metal tubes with brass and iron plates supported by heavy wooden crossbars. This was soon adopted by the leading manufacturers. Babcock of Boston in 1825 tried a cast-iron frame, and in 1832 Allen produced a frame that combined the string-plate, tension bars, and wrest-plank in one casting. This was still further improved by Chickering in 1837. In 1859 Steinway & Sons of New York added to the metal frame in one casting an agraffe, which is a small metallic support for the string, inserted between the bridge and the string for the purpose of preventing vibration in that part of the string. The same firm introduced also a double overstrung scale, which is obtained by dividing the strings into two sets, so that one set lies diagonally across the other.

Besides the improvements mentioned innumerable others have been and are still being made. From the four-octave instrument of Cristofori with a moderate tension, supported by a wooden sounding board, the modern pianoforte has developed into an instrument of tremendous tone-power with a compass of over seven octaves and a tension amounting to several tons. A modern pianoforte consists of the following parts: (1) The *frame*, now almost universally made of iron cast in a single piece. At the rear end is attached the *string plate*, into which the strings are fastened. In the front there is the *wrest-plank*, into which the *tuning-pins* are set. Around these is wound the other end of the string, and by turning these pins the tension of the strings is regulated. (2) The *sounding-board*, a thin piece of wood placed under the strings for the purpose of reinforcing the tone by means of sympathetic vibration. (3) The *strings*, made of steel wire, increasing in length and thickness from the treble to the bass. The lower ones are made heavier by being *overspun*, i.e. wound around with a coil of thin copper wire. For the very lowest tones only one wire is used (A–F♯). Then two strings for each tone (G_2–C); above that three strings. (4) The *action*, the entire mechanism required for propelling the hammers against the strings. This includes the keyboard, a row of keys manipulated by the fingers. The keys corresponding to the natural tones are made of ivory, those corresponding to the chromatically altered tones, of ebony. When a key is pressed down the rear end rises and lifts a rod, called *jack*, which, in turn, throws the *hammer* against the string or strings. At the same time a *damper* is raised. The hammer, having struck the string, falls back immediately and is caught by a *check*, preventing a rebound. But as long as the key is pressed down the damper remains raised and thus allows the string to vibrate freely. (5) The *pedals*, levers pressed down by the feet. (a) The *forte* or *loud* pedal raises all the dampers, so that all the strings struck continue to vibrate even after the keys are released. (b) The *soft* pedal, which either throws all the hammers nearer to the strings, so that the striking distance is diminished by one-half, or shifts the hammers a little to one side, so that only a single string instead of the two or three is struck. (c) Some pianos have a third or *sustaining* pedal which does not raise *all* the dampers, but keeps raised only such as are raised by the keys at the moment this pedal is applied. (d) Recently many upright pianos have been built in which the application of a pedal interposes a strip of felt between the hammers and strings, so that only a very faint sound is produced. This is a great convenience while practicing. (6) The *case*. According to the shape of the case, pianos are classified as grand, square, and upright. The square form is no longer built, although many instruments of that shape are still in use. For use in private homes they have been entirely superseded by the uprights, which latter take up far less room. The grand pianos are built in various sizes, from the full concert grand, 8 feet 10 inches long, to the parlor or baby grand, 6 feet long. The cases are often very elaborately carved or even inlaid. There have been special instruments made that cost $50,000.

For the sake of completeness, it is necessary to speak briefly about some inventions made in connection with the pianoforte. There is a device for increasing the volume of tone. This is the *æolian attachment*, an arrangement by means of which a current of air is directed against the strings, reinforcing the vibrations and thus causing a considerable increase in the volume and duration of the tone. In 1891 Dr. Eisenmann, of Berlin, invented the *electric piano*. Besides the ordinary hammer-action this instrument has an electro-magnet attached to each string. By pressing down the keys an electric circuit is closed, and the action of the electro-magnets causes a steady vibration of the strings. When the electric action is employed alone, the tone of the piano closely resembles that of the stringed instruments. By means of a special pedal any tone or chord can be sustained at will even after the fingers have left the keys. The electric action of the hammer-action may be employed each separately, or both may be combined. Many ingenious devices have been invented by which the piano can be played automatically, the most successful of which is perhaps the *pianola*. The great advantage of this invention is the control which the player can exercise over expressive interpretation by means of fine dynamic shading

and modifications of tempo. But, like all mechanical contrivances, it has its shortcomings, as the inability to bring out a melody in the middle voices. The idea of dumb keyboards is quite old. The *digitorium* or *dumb piano* is a portable box having five keys supported on springs. The use of it has always been strongly condemned by good musicians. In 1883 Mr. Virgil of New York invented the *Virgil practice clavier*, which is now extensively used and has several points of excellence. It has a complete keyboard. Each key when pressed down gives an audible click. There is a mechanism by means of which the player is enabled to cause a second click upon the release of a key. This is of great advantage in the practice of a legato touch. The performer need only see to it that the two clicks, the one produced by the release of a key, the other by the depression of the next key, coincide exactly. By means of a mechanical adjustment the action can be regulated at will from the very lightest pianoforte touch (2 ounces) up to 20 ounces. If used with judgment this is an excellent device for acquiring strength of the fingers. For exercises of a purely technical nature, the clavier is a valuable help. Some standard works dealing with the history of the pianoforte are: Rimbault, *History of the Pianoforte* (London, 1860); Paul, *Geschichte des Klaviers* (Leipzig, 1868); Gontershausen, *Der Klavierbau* (Frankfort, 1870); Ponsicchi, *Il pianoforte, sua origine e sviluppo* (Florence, 1876); Blüthner and Gretschel, *Lehrbuch des Pianofortebaues* (Weimar, 1886); Spillane, *History of the American Pianoforte* (New York, 1890); Hipkins, *The Pianoforte* (London, 1896); Bie, *A History of the Pianoforte and Pianoforte Players*, trans. from the German (London, 1899). See HARPSICHORD; MONOCHORD; PANTALEON; SPINET; VIRGINAL.

PIARISTS (from Lat. *pius*, pious), or FATHERS OF THE PIOUS SCHOOLS. A religious congrégation for the education of the poor, founded at Rome at the end of the sixteenth century by Saint Joseph of Calasanza. He was a Spanish priest who, while in Rome, was struck with the imperfect and insufficient character of the education even of the higher classes, and decided to devote himself wholly to the meeting of this want. In 1597 he opened a school, with the assistance of a few like-minded friends, which rapidly increased until, seven years after, it numbered 900 pupils, and in 1613 as many as 1200. In 1617 the associates were recognized as a congregation by Paul V., who warmly approved the work. It spread during the seventeenth century into various European countries, and now numbers some 350 members, principally in Italy, Spain, and America. The general, who is chosen for nine years, resides in Rome, where general chapters are held every six years. The system of education adopted in their schools is very thorough, and in many ways resembles that of the Jesuits, with whom the Piarists have always had some affinity; on the suppression of the Society of Jesus they received many of its members into their ranks.

PIAS'SABA, or **PIAÇABA** (Port. *piassava*, *piaçab*, from the native Brazilian name). A remarkable and important vegetable fibre produced by one or more species of South American palms. The greater part is furnished by the coquilla nut palm (*Attalea funifera*), but Wallace states that much of it is produced from a species of Leopoldinia, which he has named *Leopoldinia piassaba*. This quality is known commercially as Para piassaba. When the leaves decay, the petioles split up into cylindrical, dark-brown hard fibres varying from the thickness of a horsehair to the size of a quill. This material has been widely used in making coarse brushes, particularly those required for street-sweeping machines, for which purpose the coarsest have almost superseded all other kinds. The smaller fibres are used for finer brushes. In Brazil, cables, baskets, hats, and many other articles are made from this fibre. Large quantities are exported.

PIATIGORSK, pyä'tê-gôrsk'. A town in Russia. See PYATIGORSK.

PIATRA, pyä'trä. A town of Moldavia, Rumania, situated on the Bistritza, about 55 miles southwest of Jassy (Map: Balkan Peninsula, F 1). It has a large number of churches and monasteries and is an important centre in the lumber trade. Population, in 1901, 17,391.

PIATT, pī'at, DONN (1819-91). An American lawyer and journalist. He was born in Ohio, was educated at Saint Xavier College, Cincinnati, studied law, and was in 1851 elected judge of the common pleas court. During President Pierce's administration he was secretary of the Paris Legation, and for some months was acting chargé d'affaires. He enlisted as a private at the outbreak of the Civil War, and rose to the rank of colonel of volunteers, having served for the greater part of the war as adjutant-general on General Schenck's staff. After the war he was a newspaper correspondent, and founded the Washington *Capital*. His publications include: *Memoirs of the Men Who Saved the Union* (1887); and the poem, *The Lone Grave of the Shenandoah* (1888). Consult Miller, *Life of Donn Piatt* (1893).

PIATT, JOHN JAMES (1835—). An American journalist and poet, born in Milton, Ind. After studies at Capital University and Kenyon College, he was connected with Louisville and Cincinnati journals, and in 1871 was chosen librarian of the House of Representatives. From 1882 to 1893 he served as United States Consul at Cork and Dublin, Ireland. His poems are collected under many titles, among which are: *Poems of Two Friends* (with W. D. Howells, 1860); *The Nests at Washington* (with Mrs. Piatt, 1864); *Poems in Sunshine and Firelight* (1866); *Western Windows* (1869); *Landmarks, and Other Poems* (1871); *Idylls and Lyrics of the Ohio Valley* (1884-88-92); *At the Holy Well* (1887); etc. His prose works are less striking than his description in verse of the sentiments that underlie life in the Middle West.—His wife, SARAH MORGAN (BRYAN), born in Lexington, Ky., August 11, 1836, is known for many volumes of verse. She issued her *Collected Poems* in 1894.

PIAUHY, pē'ou-ē'. A State of Northeastern Brazil, bounded on the east by the States of Ceará and Pernambuco, on the south by Bahia, on the northwest by Maranhão (Map: Brazil, J 5). On the Atlantic Ocean, on the north, it has a coast line of less than 10 miles. Area, 116,218 square miles. The surface consists mainly of sparsely wooded tablelands or *campos*, with lowlands in the north and west and along the rivers. There are no forests and the climate is dry and

hot. The chief rivers are the Paranahyba and its affluents. Agriculture is hindered by droughts and the scarcity of population, and the attempts to establish colonies of foreign immigrants have not been successful. Sugar, manioc, tobacco, and grain are raised in quantities hardly sufficient for domestic consumption. Cattle-raising is more extensive. Piauhy contains iron, aluminum, and some silver, but the deposits are not worked to any extent. The population was estimated in 1894 at over 300,000, mostly of mixed race. The capital is Theresina (q.v.), and the chief port is Paranahyba.

PIAZZA ARMERINA, pē-ät'sä är'mā-rē'nä. A town in the Province of Caltanissetta, Sicily, 18 miles southeast of Caltanissetta. It stands on the crest and slopes of an isolated hill on the left bank of the Terranova. It is the residence of many nobles and landowners. The town has a Renaissance cathedral (1517), an old castle now used as a prison, a gymnasium, a seminary, a technical school, a theatre, and a picture gallery. The trade is chiefly in corn, wine, oil, fruits, and nuts. Piazza Armerina was founded by the Greeks. It was destroyed in 1160, but was soon rebuilt. Population (commune), in 1881, 19,591; in 1901, 24,379.

PIAZZA DELLA SIGNORIA, dĕl'lä sē'nyō-rē'ä. See Florence.

PIAZZA DEL POPOLO, pō'pō-lō. See Rome.

PIAZZA DI SPAGNA, spä'nyä. A square in Rome named from the Palazzo di Spagna, the residence of the Spanish ambassador. It is the centre of the foreign colony. Its most noted feature is the famous Spanish steps, leading to the Church of the Trinità de' Monti, and the resort of picturesquely clad artists' models.

PIAZZA NAVONA, nä-vō'nä. The second largest public place of Rome, laid out on the site of the Stadium of Domitian, on the ruins of which the surrounding buildings rest. The piazza, officially called the Circo Agonale, corresponds in size and shape to the ancient stadium, and contains three fountains and an obelisk in honor of Domitian, originally in the circus of Maxentius.

PIAZZA VENEZIA, vā-nā'tsē-ä. See Rome.

PIAZZI, pē-ät'sē, Giuseppe (1746-1826). An Italian astronomer, born at Ponte. He is known principally for his work at Palermo, where he went in 1781 to take the chair of mathematics, and where he established an observatory, which was put in working order in 1789. The first results of his observations were the corrections of some errors in the estimation of the obliquity of the ecliptic, the aberration of light, the length of the tropical year, and the parallax of various heavenly bodies. These results were published in 1792. On the night of January 1, 1801, he discovered a new planet, the first known of the planetoids (q.v.). Piazzi was able to obtain only a very few observations of it before it passed too near the sun to be visible; from which Gauss (q.v.) was nevertheless able to compute its orbit so that it was again found later in the year. Piazzi named it Ceres, after the ancient goddess of Sicily. In 1803 he published a catalogue of the fixed stars, the result of ten years' observations and far superior to any before published. It was rewarded with a prize from the Institute of France. In 1814 appeared a new and more complete catalogue, containing 7646 stars, for which he was again rewarded with a prize from the French Institute. This catalogue is now regarded as his work of most lasting value to astronomy; and a new computation of his observations, using modern methods, is now being made. He also made researches into the nature of comets. In 1817 he was called to Naples as chief director of the Government Observatory, where he remained till his death.

PI-BESETH, pē-bā'sĕth. See Bubastis.

PIBROCH, pē'brŏk (Gael. *piobaireachd*, art of playing on the bagpipe, from *piobair*, piper, from *piob*, bagpipe + *fear*, Olr. *fer*, man, connected with Lat. *vir*, Lith. *výras*, Lett. *wirs*, Skt. *vīra*, Goth. *wair*, AS., OHG. *wer*, man). The highest form of music written for the bagpipe. It consists of a series of variations written on a fundamental theme called *urlar*. These variations (generally three or four in number) increase in difficulty and speed, the last one, *crunluidh*, being a furious *presto*. What renders the notation of pibrochs particularly difficult is the great number of ornaments introduced, so that no definite rhythm can be discovered. A still greater difficulty is encountered because they make use of the eleventh overtone (a tone between f and f♯), and thus cannot be reduced to any scale. Only in comparatively recent times (nineteenth century) has the expression of pibrochs in our notation been attempted. Before that, all music for the bagpipe was taught by a special system, the different tones having such names as *hodroho*, *hananin*, *hiechin*, etc. Niel Macleod published in 1828 at Edinburgh a collection of pibrochs in this peculiar notation. See Bagpipe.

PICA. See Printing.

PICAN'DER. The pseudonym of the German poet Christian Friedrich Henrici (q.v.).

PIC'ARD. A corruption of Beghard. See Beguines.

PICARD, pē'kär', Jean (1620-82). A French astronomer. In 1655 he succeeded Gassendi as professor of astronomy in the Collège de France. In 1666 he became a member of the Academy of Sciences. In 1671 he went to Uranienborg, on the island of Hven in the Sound, to determine the latitude and longitude of Tycho Brahe's observatory. The Paris Observatory and the *Connaissance des Temps* were founded by his efforts. He is known especially for his geodetic work in connection with determining by measurement the exact length of a degree of latitude.

PICARD, Louis Benoit (1769-1828). A French dramatist, born in Paris. He began early to write plays, the first of which was *Le badinage dangereux* (1789). In many that he subsequently produced, he was both author and actor, and he had several collaborators. His plays, excellent pictures of the time, are satirical and vivacious, and have animated dialogue. The best include: *Encore des méprises* (1791), which made his reputation; *Médiocre et rampant* (1797); *Les marionnettes* (1807); *Les capitulations de conscience* (1809); and *L'intrigant maladroit* (1820). Several of them are printed in his *Théâtre* (8 vols., 1821) and *Théâtre républicain* (1832).

PIC'ARDY (Fr. *Picardie*). Formerly a province of France, now constituting the Department of Somme and parts of the departments of

Pas-de-Calais, Aisne, and Oise. Its principal town was Amiens. In 1167 Philip of Alsace, Count of Flanders, became Count of Picardy. It was acquired by Burgundy in 1435 and was united to France in 1477.

PIC'CADIL'LY. An important London street extending for about a mile between the Haymarket and Hyde Park Corner. One portion of the street contains many handsome shops, while the other is given up to fashionable residences. The name is referred to a kind of lace, fashionable in Queen Elizabeth's time, or to the collars so called during the reign of James I.

PICCINI, or **PICCINNI,** pē-chē'nē, Niccolò (1728-1800). An Italian composer. He was born in Bari, and studied music with Durante and Leo at the Conservatory of Sant' Onofrio, Naples. After producing a number of operas at Naples he removed to Rome, where he brought out *Allessandro nell' Indie* (1758); *Cecchina zitella, ossia la buona figliuola* (1760), which had an unparalleled success; and *L'Olimpiade* (1761). In 1776 he went to Paris, where Gluck was then the popular composer. Marmontel and others championed Piccini, and for several years a bitter controversy was carried on between the 'Piccinists' and the 'Gluckists.' Marmontel made a modern version of Quinault's drama *Roland*, and Piccini composed an opera on it, which had great success. He also composed *Iphigénie en Tauride*, a subject on which Gluck had also written an opera, *Atys*, and many others. He was professor in the Ecole de Chant (1783-91), was removed, and returned to Naples, where he suffered much annoyance from the espionage of the Government on account of his supposed revolutionary sympathies. Returning to Paris in 1798, he succeeded in obtaining from Bonaparte the inspectorship of music at the National Conservatory, but he did not live to begin the duties of his office. He is of interest to the musical historian, not so much for the quality of his work, or his ability as an artist, as for the important part he played in the overthrow of Logroscino (q.v.), whose buffo operas were then the vogue in Naples; and his own defeat (together with the ideas for which he stood) by Gluck (q.v.). He died at Passy, near Paris.

PICCININO, pē'chē-nē'nō, Nicolà (1375-1444). An Italian soldier, born at Perugia. He entered the band of condottieri led by Braccio da Montone, and after the death of their chief was elected to succeed him. For a short time he served Florence, but in 1425 went over to Filippo Maria Visconti, of Milan. Fighting in his interest, he defeated Carmagnola and the Venetians at Soncino and at Cremona (1431), and at Imola in 1434 gained a victory over the Venetians and Florentines. He captured Bologna in 1438. The city revolted from Piccinino's rule in 1443, and, overcome by reverses and the loss of his son, he died in the next year.

PICCIOLA, pēt'chō-lä. A pathetic story by Saintine (1836) which attained wide popularity and brought the author a decoration and the Montyon prize. It is the story of a prisoner in the time of Napoleon I., who beguiles the monotony of his confinement by caring for a plant which springs up between the stones of his cell, and which he calls *Picciola* (poor little one). The prisoner's life is saved in sickness by an infusion of the leaves of the plant, which withers and dies after his release.

PIC'COLO (It., small). A flute of small dimensions, having the same compass as the ordinary flute, while the notes all sound an octave higher than their notation. In joyous as well as violent passages this instrument is sometimes very effective in an orchestra. The piccolo is usually made in three keys, C, D♭, and E♭, the latter two being used almost exclusively in military music. Piccolo is also the name of an organ stop. See Flute.

PICCOLOMINI, pik'kō-lōm'i-nē. The name of an old Italian family, whose ancestors settled at Rome, afterwards removed to Siena, and finally obtained the Duchy of Amalfi. Its most eminent member was Æneas Sylvius Piccolomini, who became Pope in 1458. (See Pius II.) The family also gave several cardinals to the Church, and another pope, Pius III. (q.v.).—Ottavio Piccolomini (1599-1656), first Duke of Amalfi, and fifth in direct descent from Pope Pius II., was a distinguished general in the Thirty Years' War on the Catholic side. He first entered the Spanish military service, and then as captain in a Florentine cavalry regiment aided Emperor Ferdinand II. against the Bohemians. He won distinction as a cavalry leader, served under Wallenstein, and at Lützen (1632) commanded the regiment of cuirassiers that met the last charge of Gustavus Adolphus. Wallenstein confided to him his secret designs against the Emperor; Piccolomini, however, communicated these designs to the Emperor, and after Wallenstein's assassination (1634) received as a reward for his fidelity a part of his estates. He took part in the battle of Nördlingen (1634), and in the following year was sent with a large force to aid the Spaniards in the Netherlands, where the French and Dutch were carrying all before them. Piccolomini speedily drove out the French, but his success against the Dutch was not so marked. In 1640 he was summoned to stay the Swedes, under Baner, who were threatening the hereditary possessions of Austria. He succeeded in checking the invaders in Bohemia and the Palatinate, but was badly beaten, along with the Archduke Leopold, in 1642 at Leipzig by Torstenson. He was now sent to the Netherlands to take command of the Spanish troops, and though the prestige of the Spanish infantry was destroyed by the Duke d'Enghien (the future Condé) at Rocroi (May 19, 1643), Piccolomini was again successful against both the French and Dutch until 1648, when he was anew summoned to Germany to encounter the victorious Swedes. The Peace of Westphalia put an end to the Thirty Years' War soon after. Piccolomini had now attained the rank of field marshal. In 1650 [illegible] to the dignity of [illegible] King of Spain conferred [illegible] the Golden Fleece [illegible] Duchy of Amalfi, which [illegible] to his family. With [illegible] Piccolomini [illegible] 7, 1656.

PICCOLOMINI. Die [illegible] second play in Schiller's Wallenstein trilogy, produced in 1799. It represents Wallenstein in the midst of his preparations to make himself master of the throne of Bohemia, and takes its name from the two Italians, Octavio and Max Piccolomini. Max,

the son, is [illegible] adherent of Wallenstein, while Octavio, the professed friend on whom Wallenstein relies, is in reality employed by the Emperor to watch him. Octavio in *Die Piccolomini* gradually involves Wallenstein in the web which leads to his death in the third tragedy of the series, *Wallensteins Tod*.

PICHEGRU, pēsh'grȳ'. CHARLES (1761-1804). A French revolutionary general. He was born February 16, 1761, at Arbois, in the Department of Jura, and was educated at the college of his native town. He subsequently attended the military academy at Brienne, where he taught mathematics and had Bonaparte as one of his pupils. He entered an artillery regiment in 1783 and was for a short time in America. He was lieutenant when the Revolution broke out. Pichegru became an ardent republican, joined the army of the Rhine, and by his soldierly qualities soon attracted general attention and earned rapid promotion. In 1793 he became general of division and commander of the Army of the Rhine, and, in conjunction with the Army of the Moselle under Hoche, repeatedly defeated the Austrians and established himself securely in the Palatinate. After the arrest of Hoche, his success at the head of the combined Rhine and Moselle armies was not less decided. The rapidity and boldness of his manœuvres when in command of the Army of the North, in 1794, again disconcerted the Allies, and they were compelled to retreat beyond the Meuse. Pichegru completed the conquest of Holland in 1795 and ended a glorious campaign by organizing the Batavian Republic. He next visited Paris, and while there suppressed an insurrection in the suburbs of the city (April 1, 1795); but soon afterwards went to take command of the Army of the Rhine, and for some time displayed his usual skill and energy, crossing the river in the face of the enemy and capturing the fortress of Mannheim. But the state of affairs at Paris, combined with the flattering promises and bribes held out to him by the Prince of Condé, converted Pichegru into a secret partisan of the Bourbons. His inactivity, though prearranged with the Austrian generals, was not suspected till he suffered himself to be defeated at Heidelberg, and retreated, leaving Jourdan (q.v.) without support, thus compelling the latter also to retire. The suspicions of the Directory were confirmed by the seizure of Pichegru's correspondence, and he was immediately superseded by Moreau (q.v.). He then retired to his native town, where he lived till 1797, when he was elected one of the Council of Five Hundred. He soon became its president; but still continuing his intrigues with the Bourbons, he was arrested, and subsequently transported to Cayenne, but escaped in June, 1798, to England. He entered heart and soul into the Bourbon conspiracy along with Cadoudal (q.v.), the two Polignacs, and others, the primary object of which was the assassination of the First Consul. The conspirators secretly reached Paris, and there in 1804 Pichegru attempted to persuade Moreau, who was on bad terms with Napoleon, to join them, but without success. But the plans of the conspirators were soon known to the police, and an intimate friend of Pichegru, with whom he resided, sold the secret of his retreat to the police. Pichegru was suddenly arrested and taken to the Temple prison February 28, 1804. On April 6 he was [illegible] dead in his bed. The Royalists endeavored to fasten a charge of secret assassination on Napoleon, but it was generally, and probably correctly, believed that Pichegru strangled himself. Consult the biographies by Gassier (Paris, 1814), Pierret (ib., 1826), Vouziers (Dôle, 1870); also Montgaillard, *Mémoire, concernant la trahison de Pichegru* (Paris, 1804); and Daudet, *La conjuration de Pichegru, etc.* (ib., 1901).

PICE'NUM. One of the ancient divisions of Middle Italy, extending along the Adriatic from the Aesis (now Esino) to below the Vomanus (now Vomano) River and bounded on the west by Umbria, Sabinum, and Vestinum. It was anciently inhabited by the Umbrians, who were conquered by the Sabines, under whom the name Picenum was acquired. In 268 the district was reduced by the Romans to the condition of a dependency and many of its inhabitants colonized in the town of Picentia. In Aeculum, the old capital of Picentum, in B.C. 91, occurred the outbreak of the war of the Italian Confederacy against Rome. Under Augustus Picenum formed the fifth political region of Italy.

PICHICIAGO. See ARMADILLO and Plate of ANT-EATERS.

PICHINCHA, pē-chēn'chä. A volcano of the western range of the Andes in Ecuador, situated a few miles northwest of Quito (Map: Ecuador, B 4). It is an irregular mass of peaks, the highest of which, Huahua-Pichincha, has an altitude of 15,918 feet. Its crater is over 2000 feet deep; it is dormant, there having been no great eruption since 1660. On its slopes, on May 24, 1822, was fought the battle which secured the independence of the Republic.

PICHLER, pĭk'lẽr, ADOLF VON (1819-1900). An Austrian poet and naturalist. He was born at Erl in Tyrol, studied at Innsbruck and Vienna, published his first volume of poems in 1846, and in 1848 fought as an Austrian volunteer in the Italian campaign with great bravery. In 1867 he was appointed professor of mineralogy and geology in the University of Innsbruck. He wrote on the geology of the Alps and of Tyrol, but is better known as the Tyrolese poet, author of *Frühlieder aus Tirol* (1846), *In Lieb' und Hass* (1869; 3d ed. 1900), *Vorwinter* (1885), and *Spätfrüchte* (1896). Valuable autobiographic material is contained in his *Aus den März- und Oktobertagen zu Wien, 1848* (1850), and *Aus dem welsch-tirolischen Kriege* (1849). Consult Prem, *Adolf von Pichler, der Dichter und Mensch* (Innsbruck, 1901).

PICHLER, KAROLINE (1769-1843). An Austrian novelist, born in Vienna. Her first novels, *Gleichnisse* (1800), *Olivier* (1802), *Leonore* (1804), *Ruth* (1805), possessed slight merit; *Agathokles* (1808), her best work, was meant to disprove the heresies of Gibbon's *Decline of the Roman Empire*. Succeeding novels were chiefly historical in matter, patriotic in purpose, and diffuse in style; e.g. *Die Grafen von Hohenburg* (1811), *Die Belagerung Wiens* (1824), *Die Schweden in Prag* (1827), *Henriette von England* (1832). She also wrote society stories, *Franenwürde* (1808), *Die Nebenbuhler* (1821), *Zeitbilder* (1840), which, like her autobiographical *Denkwürdigkeiten* (1844), are wearisome. Her works are in 60 vols. (1845).

PICHU'RIC ACID. See LAURIC ACID.

PICIDÆ, pĭs′ĭ-dē (Neo-Lat. nom. pl., from Lat. *picus*, woodpecker). The family of woodpeckers (q.v.).

PICK, Bernhard (1842—). A Lutheran clergyman, born at Kempen, in Prussia. He studied in Berlin and at the Union Theological Seminary, New York City. In 1868 he entered the Presbyterian ministry, and, after having held several pastorates in that Church, he joined the Lutheran denomination in 1884. Besides contributing to the *Cyclopædia of Biblical, Theological, and Ecclesiastical Literature*, the *Cyclopædia of Religious Knowledge*, and many periodicals, his publications include: *Luther as a Hymnist* (1875); *Life of Christ According to Extra-Canonical Sources* (1887); and *The Talmud, What It Is and What It Says About Jesus and the Christians* (1887).

PICKELHERING, pĭk′el-hā′rĭng. A stock fool in the drama. The name was probably first assumed in the early part of the seventeenth century by Robert Reynolds, who traveled through Germany with a company of strolling comedians, and created a type which maintained itself until the eighteenth century.

PICK′ENS, Andrew (1739-1817). An American soldier, born at Paxton, Pa. He removed with his parents to the Waxhaw settlement, S. C., in 1752, and fought in the Cherokee war in 1761 as a volunteer. At the beginning of the Revolutionary War he became captain of a militia company, and by successive promotions soon attained the rank of brigadier-general of South Carolina troops, gaining great distinction as a partisan leader. In 1779 he defeated a superior force of loyalists under General Boyd at Kettle Creek, participated on June 10th in the battle of Stono Ferry, and defeated the Cherokees at Tomassee. He commanded the militia at the battle of Cowpens, January 17, 1781, twice rallying them after they had been driven back, and for his gallantry received a sword from Congress. At the battle of Eutaw Springs, September 8, 1781, he was in command of the Carolina militia, and in 1782 forced the Cherokees to relinquish their claim to a large tract of land now included in the State of Georgia. After the war he was a member of the South Carolina Legislature from 1783 to 1794; sat in Congress in 1793-95; was a member of the State Constitutional Convention; became major-general of militia in 1795; and was again in the Legislature in 1801 and 1812. He was commissioner on many occasions to treat with the Indians. His son, Andrew, a lawyer, was Governor of South Carolina in 1816-18, and died in Mississippi in 1838.

PICKENS, Fort. See Fort Pickens.

PICKENS, Francis Wilkinson (1805-69). An American statesman and diplomat, born at Togadoo, Saint Paul's Parish, S. C. He studied at South Carolina College, was admitted to the bar in 1829, and three years afterwards was elected to the State Legislature, where he soon became prominent as an advocate of nullification and the doctrine of extreme States' rights. From 1834 until 1844 he was a member of Congress, in 1850-51 a delegate to the Nashville Southern Convention, and in 1854 presiding officer of the South Carolina State Convention, and in 1856 a delegate to the General Democratic Convention in Cincinnati. The next year he was appointed United States Minister to Russia, but returned to America in 1860, and soon afterwards was elected Governor of South Carolina. He zealously supported the secession movement, and immediately after the passage of the ordinance by the Charleston Convention began to organize an independent government. To this end he demanded the surrender of all Federal property within the borders of the State, and when Major Anderson refused to give up Fort Sumter, began to erect the batteries which afterwards, under the orders of the Confederate Government, caused its reduction.

PICKEREL (double diminutive of *pike*). One of the smaller members of the pike family, Luciidæ. The Eastern or pond pickerel, jack, or green pike (*Lucius reticulatus*) is common everywhere east and south of the Alleghany Mountains. In Tennessee and Arkansas it reaches a length of 24 inches and is golden green marked with numerous dark lines and streaks, which are mostly horizontal, and by their junction with one another produce a reticulated appearance. The banded pickerel (*Lucius Americanus*), of the coast streams from Massachusetts to Florida, is 12 inches long and dark green, with about 20 blackish curved bars on the sides. The little pickerel (*Lucius vermiculatus*) occurs throughout the Mississippi Valley, is 12 inches long and very variable in color, with an irregular network of fine curving streaks on the sides. The common pike is also frequently called 'pickerel.' The habits and mode of catching are the same as in the case of the pike (q.v.). See Plate of Needlefish, Pikes, etc., and Colored Plate of American Game Fishes, accompanying article Trout.

PICKEREL FROG. A small light brown frog (*Rana palustris*) with dark square or oblong brown blotches in two rows on its back, and the head marked by a dark line which runs from the nostril to the eye. This frog dwells in the Eastern United States, especially in mountainous parts, and occurs mainly about springs.

PICK′ERING, Charles (1805-78). An American naturalist, grandson of Col. Timothy Pickering, born at Starucca Creek, Pa. He graduated at Harvard in 1823, and at the Medical School three years later. After practicing for some years he was, in 1838, appointed naturalist of the United States Exploring Expedition under the command of Lieut. Charles Wilkes (q.v.). In 1843 he visited Egypt, Arabia, East Africa, and India. He published: *The Races of Man and Their Geographical Distribution* (1848); *The Geographical Distribution of Animals and Plants* (1854); and *The Chronological History of Plants: Man's Record of His Own Existence Illustrated Through Their Names, Uses, and Companionship* (1879).

PICKERING, Edward Charles (1846—). An American astronomer, born in Boston. He graduated at the Lawrence Scientific School, Harvard, in 1865, and for the next two years was instructor of mathematics there. From 1867 until 1877 he was Thayer professor of physics at the Massachusetts Institute of Technology, but in the latter year he was appointed professor [illegible] observatory. At the Institute of Technology he, in 1870, established the first physical laboratory for general instruction in the United States, and later, in connection with his work at Harvard, established an

observatory at Arequipa, in Peru. He devoted particular attention to the study of light and the spectra of the stars and published the results of his observations in the *Annals of the Harvard Observatory*. He also wrote *Elements of Physical Manipulation* (1874).

PICKERING, John (1777-1846). An American linguist and lexicographer, son of Timothy Pickering, born in Salem, Mass. He graduated at Harvard in 1796, studied law with Edward Tilgham in Philadelphia, was Secretary of Legation in Lisbon until 1799, and then became private secretary to Rufus King, Minister to England. He practiced law in Salem, Mass., from 1801 to 1827, was City Solicitor of Boston (1827-46), and during his service in the State Legislature took a prominent part in revising the Massachusetts general statutes. He was president of the American Academy of Sciences, first president of the American Oriental Society, an able linguist, and, like his father, particularly interested in the languages of the North American Indians. He wrote *A Uniform Orthography for the Indian Languages* (1820), *Remarks on the Indian Languages of North America* (1836), *Vocabulary of Words and Phrases Supposed to Be Peculiar to the United States* (1816), and a *Greek and English Lexicon* (1826, 3d ed. 1846), as well as many monographs on ancient and international law. Consult the biography by his daughter, Mary Orne Pickering (Boston, 1887).

PICKERING, Timothy (1745-1829). An American statesman. He was born at Salem, Mass., July 17, 1745, graduated at Harvard in 1763, and was admitted to the bar in 1768. In 1773 he drafted for the town of Salem a paper entitled *State of the Rights of the Colonists*, and in the following year the memorial of the citizens of Salem to General Gage in regard to the Boston Port Bill. In 1776 he joined the Revolutionary Army and led an Essex County regiment to Tarrytown, N. Y. In the following year he took part in the battles of Brandywine and Germantown, and was appointed a member of the Congressional Board of War. In 1780 he was appointed Quartermaster-General of the army and retained the office until its abolition in 1785. Upon his retirement from the army, he engaged in business in Philadelphia, but two years later removed to the Wyoming Valley and became involved in the disturbances of that region, where he was instrumental in maintaining order and quiet. He settled the territorial disputes between Pennsylvania and the inhabitants of the Wyoming Valley, and organized Luzerne County, which he represented in the Pennsylvania Constitutional Convention of 1789. In 1790 he was commissioned by President Washington to negotiate a treaty with the Six Nations, which he did successfully, and later performed a similar service with the Indians of the Northwest. In 1791 Colonel Pickering was appointed Postmaster-General of the United States, which office he held until 1795, when he was appointed Secretary of War. Pickering signalized his administration by establishing a military school at West Point and by supervising the construction of the frigates *Constitution*, *United States*, and *Constellation*. Upon the resignation of Edmund Randolph near the end of 1795, Colonel Pickering was appointed Secretary of State, which office he held during the remainder of Washington's term and through the greater part of Adams's administration. In 1800 he was abruptly removed on account of a serious disagreement with the President growing out of the difficulties with France over the X. Y. Z. correspondence (q.v.). He then retired to his uncleared lands in what is now Susquehanna County, Pa., but was in poor circumstances, and some of his Massachusetts friends prevailed upon him to return to his native State, where in 1802 he became Chief Justice of the Court of Common Pleas. In the following year he was elected to the United States Senate, where he served until 1811. As a member of the House of Representatives he served until 1817, when he refused a renomination and again retired to private life. He died at Salem, January 29, 1829. Pickering wrote numerous political papers, including a *Review of the Correspondence Between John Adams and William Cunningham*. A biography of Colonel Pickering in 4 vols. was published by Octavius Pickering and C. W. Upham (Boston, 1867-73).

PICKERING, William (1796-1854). An English publisher. After serving for ten years in a Quaker publishing house in Cornhill, London, he opened a bookshop of his own in Lincoln's Inn Fields (1820). Adding publishing to the business, he subsequently moved to Chancery Lane (1824) and to Piccadilly (1842). For printing he employed the Chiswick Press. About 1830 he adopted the trade-mark of Aldus, the famous Italian printer—an anchor entwined with a dolphin, to which was added the motto, *Aldi Discip. Ang.* Among his notable undertakings were the "Diamond Classics" (a series of delicate volumes in 48mo and 32mo, issued between 1821 and 1831); and reprints of different versions of the Book of Common Prayer between 1549 and 1662 (6 vols., 1844), the typography of which has probably never been surpassed. Among his sumptuous publications may be cited Walton's *Compleat Angler*, illustrated by Stothard and Inskipp (2 vols., 1836). He also projected the Aldine edition of English poets. After his death the business was carried on by his son, Basil Montague Pickering (1836-78), who, among several reprints, issued a facsimile of the first edition of *Paradise Lost*. In 1878 the firm came to an end.